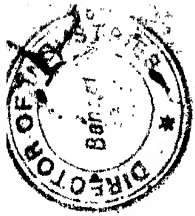

DIRECTOR OF

SEALING-WAXES,
WAFERS, AND OTHER ADHESIVES.

SEALING-WAXES, WAFERS, & OTHER ADHESIVES

FOR THE

HOUSEHOLD, OFFICE, WORKSHOP, AND FACTORY.

BY

H. C. STANDAGE,

AUTHOR OF "LEATHER WORKER'S MANUAL," ETC.

LONDON:

SCOTT, GREENWOOD & SON

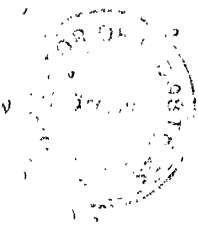
"THE OIL AND COLOUR TRADES JOURNAL" OFFICES

8 BROADWAY, LUDGATE HILL, E.C.

CANADA: THE COPP CLARK CO. LTD., TORONTO

UNITED STATES: D. VAN NOSTRAND CO., NEW YORK

1902.



PREFACE.

SEALING-WAXES are articles that have almost ceased to be in general use, but they are so serviceable in many cases where other adhesives are not suitable that they will never entirely go out of use; in fact there is a fortune awaiting any one who will invent a *liquid* sealing-wax. The manufacture of stick sealing-wax is in only a few hands; but as there are no mysterious difficulties in producing these waxes, instructions given in this book will afford the requisite particulars for the production of sealing-wax by any person who so desires.

Wafers were at one time the sole means of sealing a letter, but now they have really almost disappeared from use; however, to make this book on adhesives complete, it would not be wise to omit details for their production.

In the sections on household cements, office pastes, and adhesives for the factory and workshop, a comprehensive selection of recipes and formulæ has been made; but to insert all the formulæ that could be given for agglutinants and adhesives in various trades would increase this book to double its size.

If the seeker after a special cement fails to discover a cement that will repair the identical material he desires,

he should scan the titles of the recipes in the various sections and choose a cement which is stated to unite a material most akin to that which he wants to rejoin.

Many cements are applicable to a variety of materials, but it is not needful to specify in detail, with every recipe, all the articles such cement will reunite.

The recipes given in this book can be thoroughly relied on, as they are what are being daily used in the commercial world, many of them having been formulated by the writer to meet special cases put before him by manufacturers.

H. C. S.

ASTON MANOR,

October, 1902.

CONTENTS.

CONTENTS.

CHAPTER IV.

CHAPTER V.

CHAPTER VI.

CHAPTER VII

CHAPTER I.

SEALING-WAXES.

INTRODUCTION—MATERIALS USED FOR MAKING SEALING-WAXES—NOTES CONCERNING THE MATERIALS, &c.—LAC, STICK-LAC, SEED-LAC, SHELL-LAC, BUTTON-LAC, GARNET-LAC—TABLE OF CONSTITUENTS OF LACS—OIL OF TURPENTINE—VENICE OR VENETIAN TURPENTINE—COLOPHONY AND ROSIN—WHITE RESIN—WAX—COLOURING MATTERS FOR SEALING-WAXES AND OTHER WAXES—VERMILION, RED LEAD, OR MINIUM—FOR BLACK WAXES: LAMP BLACK, CARBON BLACK, VINE BLACK—GREEN PIGMENTS—BLUE COLOURING MATTERS—BROWN COLOURING MATTERS—INERT SUBSTANCES USED IN SEALING-WAXES.

SEALING-WAXES.

French, *Cire à cacheter*. German, *Siegellack*.

THE modern article cannot with truth be called a wax, because it is essentially a compound of resins; but the term "sealing-wax" is of very ancient origin. In early times coloured beeswax was used for sealing letters and for attaching the impression of seals to documents, but on the introduction of lac from the East Indies into Venice the use of beeswax was discarded. Lac is a resinous substance obtained from trees indigenous to India, and the property of lac, as an adhesive material, has been known from time immemorial to the Hindoos, who used lac for sealing manuscripts long before it was known in Europe. From Venice the importation of lac passed into Spain and became known commercially among the merchants as Spanish wax. Why

lac should be designated as wax we have no data, but probably it was due to the fact that beeswax had previously been used for a similar purpose, consequently the newly imported material was dubbed the same name.

Sealing-waxes are made of several qualities—extra superfine, superfine, fine, and common. In the best-class waxes only the purest and finest-grained materials are used, whereas in the lowest grade inferior-quality materials are employed.

The simplicity of using a stick of sealing-wax renders this adhesive a very popular one for sealing up letters, &c.; but since the introduction of gummed envelopes its use for such purposes has greatly declined, its chief purpose now being that of receiving an impression of a seal on some document or legal instrument, although those persons entitled to armorial bearings do not neglect this useful article for sealing their letters.

The art of taking a neat impression of a seal, particularly if such seal be of large dimensions, requires skill and experience, because to obtain a correct and complete impression the whole of the wax covered by the seal must be in a plastic condition. It is no easy matter to obtain a large patch of wax in a uniform plastic condition by the usual method adopted, viz., holding the stick of wax over a flame and dropping the molten mass on the paper or document which is to bear the impressed seal. The usual amateurish attempt results in getting the patch of wax more or less discoloured with the sooty smoke. It is only the very best quality wax that will allow an impression of a large seal being obtained successfully. Considering the fact that a stick of sealing-wax readily dissolves in alcohol, it is strange that no manufacturer has been enterprising enough to put a liquid sealing-wax on the market—one that could be poured out of a bottle and which would set firm and hard in a

reasonable time, but at the same time be plastic and adhesive.

Besides sealing-wax for closing up letters, there are kindred forms of wax called parcel wax and bottle wax.

Parcel wax is the coarser kind of sealing-wax, being made in the same manner but with inferior and cheaper materials. Such wax is used for spreading over string and cord employed in binding up a parcel, so as to prevent the string being surreptitiously unfastened. The sticks are larger than those used for sealing letters, being usually $\frac{3}{4}$-in. to an inch in diameter, and of a more or less oval shape. Such sticks of wax are useful for fastening up the ends of paper parcels and packages.

Bottle wax is a still coarser kind of sealing-wax. It is used for coating the corks of bottles the contents of which it is desired to keep air-tight The process of manufacture is similiar to that of sealing-wax. As this class of wax must of necessity be very low in price, only the very cheapest colouring matters are employed, and instead of the expensive shellac common rosin is the chief ingredient.

Materials Used in Making Sealing-waxes.

In the finest quality of sealing-wax the best pale-coloured shellac is the chief ingredient, while Venice turpentine, magnesia, and the best-quality pigments are used as colouring materials. In common waxes ordinary rosin is the chief ingredient, and oil of turpentine, chalk, soot, and ochres and other earths are employed for colouring matters.

The following is an alphabetical list of the materials used in making various grades of sealing-waxes:—

Asphaltum.
Barium sulphate.

Beeswax.
Berlin blue.
Bismuth nitrate.
Bleached shellac.
Blue colouring matter.
Brick-dust.
Carbon black.
Chalk.
Chinese vermilion.
Chrome yellow.
Cinnabar.
Clarified tallow.
Colcothar.
Colophony.
Copper carbonate.
Glycerine.
Gypsum.
Ivory black.
King's yellow.
Lamp black.
Minium.
Magnesia.
Mastic.
Mountain blue.
Ochre.
Olive oil.
Oil of turpentine.
Pine resin.
Rosin.
Red lead
Rhine oil.
Shell-lac.
Smalt.
Soot.

Suet.
Tallow.
Vermilion.
Venice turpentine.
Vine black.
White wax.
Whiting.
White resin.
Yellow wax.
Zinc white.

Notes Concerning the Materials Used in Making Sealing-waxes.

Lac, Seed-lac, Stick-lac, Shell-lac, Button-lac, and Garnet-lac.—Lac is from a Greek word meaning milk. That is the general name given to the resinous matter produced by the *Coccus lacca* insect. This bug-like insect attaches itself to the new wood and fresh twigs of several species of trees growing in India. After having attached itself the insect remains there permanently until its death.

It is the female insect which thus immolates its life for the purpose of propagating its species, because after attaching itself to the twig the insect forms an incrustation around its body, leaving only one opening—a posterior one—through which the young insect emerges, directly it is hatched from the eggs which the parent insect has laid in cells formed in the incrustation. The lac incrustation is not the actual gummy exudation from the trees, but a secretion formed from the sap by the female. Thus the insect punctures the bark and begins to secrete the lac, forming it into cells in which it lays its eggs. This process of secretion proceeds until the insect is completely incrusted with the lac, the breathing of the insect being carried on by means of two

fine filaments which are sent to the surface for that purpose. When all its eggs are laid the elderly female dies. (The length of life enjoyed by the insect is two and a half months, so perhaps it may be libellous to call it an "elderly" female.) However, when the embryo insect is developed it breaks through its own tiny shell and emerges from the posterior orifice left in the incrustation made by the maternal parent. The process of lac production then proceeds *de novo*. The male insects (which are comparatively few in number in comparison with the females) impregnate the females, when they swarm over the fresh wood of the tree and carry on the same process of secretion as that just described. Owing to the small size of the insect a tree can support a very large number of them, but eventually—like all parasitical friends—they sap the vitality of the tree to such an extent that it dies. To keep up the supply of lac, the swarming of trees with the new batch of young insects is carried on artificially by breaking off twigs and branches of lac-incrusted trees, about two weeks before the young insect emerges, and tying the twigs and branches up to fresh wood of unpunctured trees. This is a much more certain method of propagation than allowing the insects to be conveyed from tree to tree by birds, insects, &c.

The best lac is collected from a few species of fig tree. The appearance of the incrustation varies: sometimes it forms coalesced rounded prominences, at some places surmounting and at others scattered over the branches; but in other instances it is superficially more like a thick irregular layer of bark roughened on its surface. Owing to the number of eggs laid by the insects, lac is of a cellular structure. To fit lac for commercial uses it has to undergo a preliminary process of purifying it from débris, &c. The result of such process is that lac is sent into commerce in the several forms indicated by the heading of this chapter.

STICK-LAC is a name given to the crude lac just as it is removed from the trees. The twigs are cut into pieces from three inches to six inches long, with the crude lac adhering; but it would not answer to export the lac in this condition, therefore it is freed from the trees by putting the sticks on a flat surface and passing a heavy roller over them, when the brittleness of the lac will cause it to break away almost entirely from the twigs. The crude lac is then put into a tub of warm water and beaten with pestles or trodden by men. By this process the colouring matter is extracted from the lac, which thus becomes converted into the state known as seed-lac. The seed-lac is separated from the coloured water, which is heated and evaporated until the liquor becomes concentrated sufficiently to be made into cakes, which consist of the body of the insect and the colouring matter extracted by the water. These cakes are sold as a commercial product under the name of lac-lake, which, until the introduction of aniline dyes, was a chief source of a red dye when used in connection with tin salts.

SEED-LAC.—Seed-lac is very seldom sent into commerce in that state. It is usually dried and melted in long cotton bags held before a charcoal fire, which causes the lac to exude through the pores of the bag, and by the men who hold each end of the bag giving it a twist the melted lac is squeezed out and drops into a trough placed in front of the fire. The melted lac is either allowed to spread itself out in a thin layer or else it is spread by a strip of leaf on a roller in a thin sheet. This roller is placed in an inclined position and the operative ladles up some of the molten lac and pours it over the surface of the roller, and as fast as he does so a second operative spreads it on the cylindrical surface by means of a plantain leaf. The lac soon cools and sets, and is then easily scraped off the roller by means of a knife, and

is ready for sale as shell-lac, or shellac as it is more frequently spelt. The best quality of shellac is that known as orange shellac; it has a bright brownish-orange colour, is transparent, and practically free from dirt and grit.

Button-lac is formed from shellac by allowing the molten lac to fall in drops on to a cold surface so as to form pieces 1½ inches in diameter instead of spreading it on a cylinder. These discs are thicker than shell-lac and therefore darker in colour, being of a darker ruby-red instead of brown-orange.

Garnet-lac is simply another name for button-lac, but made in thicker pieces. Generally speaking the latter two forms of lac are not so free from impurities as shell-lac.

The industrial applications of lac are very numerous, it being used for making polishes, varnishes, lacquers, &c. When colour is not an object of consideration, button or garnet-lac is generally used; but for special varnishes that are to be coloured only the best transparent orange shellac should be employed; so likewise in the better quality sealing-waxes. Lac is more or less soluble in many fluids, but only partially soluble in alcohol, because there is a small percentage of a waxy constituent which will not completely dissolve in alcohol or methylated spirit, except at a certain temperature. Ether, chloroform, and turpentine also only partially dissolve lac, while petroleum spirit refuses to dissolve it *in toto*. Alkalies, such as caustic potash, soda, ammonia, and even borax, will dissolve lac, forming aqueous solutions which are often claimed to dry to a waterproof coating, but this statement is erroneous. One of the properties of alkalies in dissolving lac is to separate the colouring matter from the resinous portion, which affords the means of producing bleached shellac. Thus, lac is dissolved in an alkaline solu-

tion and then chlorine gas is passed through the fluid, when the lac is precipitated in an almost colourless condition. By washing this bleached lac in warm water and pulling it apart in a similar manner to what the confectioner employs in making "candied" sugar, the lac is obtained in silky-looking fibrous sticks of a pale straw colour; but for use in varnish-making this variety of lac must be used *at once*, otherwise it loses the quality of being dissolved in any menstruum. The actual constituents of crude lac are tabulated below:—

	Stick-lac.	Seed-lac.	Shell-lac.
Resin	68·0	88·5	90·7
Colouring matter	10·0	2·5	0·5
Wax	6·0	4·5	4·0
Gluten	5·5	2·0	2·8
Foreign bodies	6·5	—	—
Loss	4·0	2·5	1·8

OIL OF TURPENTINE is one of the five varieties of turpentine met with in commerce. The word turpentine is given to the resinous exudation of pine and other coniferous trees. But, in its general acceptance, the word is now used almost exclusively for oil or spirit of turpentine, which is the volatile fluid obtained by distilling the crude resinous turpentine. The fluid turpentine, distinguished as oil or spirit of turpentine, or even as turps, is of three qualities, viz., American, French, Russian. The first variety is obtained from the *Pinus australis*, the second from the *P. maritima*, and the last from the *P. silvestris*, which is indigenous to Scotland. The methods of obtaining these turpentines need not be recapitulated here. What the sealing-wax maker is chiefly concerned with is that he is supplied with a pure turpentine, not a turpentine substitute; for although a rose under any other name may smell as sweet, yet turpentine bought

under any fanciful name will not be equal to the genuine article in qualities.

Turpentine is a hydrocarbon body, that is, it does not possess any oxygen in its composition, like alcohol, ether. Its formula is $C_{10}H_{16}$; but, as if to annoy the uninitiated buyer of turpentine, there are many isomeric compounds which also possess the above constituents in the same proportion. They are known by the names of terpenes, and it is these, or mixtures with these of other fluids, which are palmed off on the unwary purchaser as genuine turpentines. As the quality of a sealing-wax will depend on the quality of the components forming it, it is necessary to have these ingredients of the best quality to ensure a good quality wax.

Turpentine is very inflammable—its flashing-point being 36° to 38° C. (97° to 100° F.)—consequently, when adding it to the molten mass of shellac and Venice turpentine, it is a necessary precaution to have the temperature of such compound below those figures, otherwise oil of turpentine is liable to become vapourised and the vapour ignited when it reaches the naked flame below the melting-trough. The burning turpentine is very fuliginous, and its flames reach a great height. The vapours, however, are not explosive or spreading like benzine and naphtha, therefore if such a conflagration in the melting-pot occur, the operator must not "lose his head," but keep calm enough to remember to put the lid on the flaming contents of the trough, or else throw an old sack or heavy carpet over it; or, if that is not near at hand, some dry ashes, dry sand, or any other inert body; even a mass of dry pigment may be thrown into the burning compound to lower its temperature. Of course the sealing-wax compound will be spoilt; but that is a small matter compared with what the destruction of the whole premises would be. When adding liquid turpentine to the molten mass, it is always best to turn off the gas-jets at the source

of heat; but the best plan is to mix the oil of turpentine with the colouring matter, so as to form a paste, which can then be added to the molten mass without risk of ignition.

Turpentine, like most commercial products in constant demand, is frequently adulterated—petroleum spirit, shale naphtha, rosin spirit, and coal-tar naphtha being the usual adulterants. The addition of adulterants influences the temperature at which genuine turpentine begins to boil, and by this means affords useful data for testing the genuineness of turpentine; but the operations are not simple enough to be carried out except by a skilled chemist.

The substitutes offered for turpentine are sold under a variety of names. They consist of a mixture of turpentine, rosin spirit, and benzoline in various proportions, or else of rosin spirit and light petroleum oils, or else heavy petroleum hydrocarbon fluids alone. All these substitutes are practically destitute of the qualities which make genuine turpentine useful as an ingredient in sealing-waxes.

Venice Turpentine or Venetian Turpentine *(Terebenthina venetia)* is a crude resinous turpentine of a semi-viscid nature. Its presence as an ingredient neutralises the brittleness of the shellac and colophony or rosin ingredients. Shellac becomes very brittle after being melted and dries very hard, but the addition of Venice and oil of turpentine gives a certain plasticity to the mass and renders it flexible. The source of supply of Venice turpentine is the *Abies larix* or larch tree, from which the resin is an exudation; but the commercial article is seldom a genuine one, generally it is a factitious compound made by melting 24lb. black rosin and adding one gallon of oil of turpentine.

Colophony and Rosin (French, *Colophane*; German, *Kolophonium*) are synonymous terms and refer to the resi-

duum obtained from the distillation of crude turpentine; but in the recipes given in this book the word colophony refers to the light almond mass obtained during the distillation of the liquid turpentine, while rosin refers to the darker-coloured residue that is left in the retort at the end of the distillation process. The light-coloured rosin is known as "window-glass" rosin, and it is a pale amber-coloured transparent mass; while "common" rosin is darker, but clear and transparent, yet homogeneous; and "black" rosin is opaque and almost approaching a black. The varieties are dependent upon the quality of the original crude resin from which the rosin is a by-product, the best or light-coloured variety being obtained from "virgin" resin, while the crude resins collected later in season give common rosin, and the scraping of the resins from the bark of the tree give black rosin.

COLOPHONY (*i.e.*, window-glass rosin) melts at a low temperature and at 212° F. is quite fluid, forming a clear yellow liquid. It is insoluble in water, but readily soluble in alkaline solutions, from which it is precipitated by means of acid; and alcohol, benzol, coal-tar naphtha, acetone, turpentine, ether, and several other fluids readily dissolve it.

When rosin (colophony) is distilled it generates some acid water, a spirit (rosin spirit), a heavy oil (rosin oil), and a residuum of pitch (artificial asphaltum). All the rosins are fusible, inflammable, and give off inflammable vapours at a low temperature. Before fusion colophony is a very brittle solid, having a glassy fracture, it is practically tasteless, but has a turpentine odour; it softens at 177° F., and is then more easily soluble than in its solid form.

WHITE RESIN of commerce owes its light yellow colour to a slight opacity due to the presence of small quantities of water.

Wax is the name given to animal and vegetable substances such as beeswax and Chinapela wax, being of animal origin; whilst carnauba, palm wax, and myrician wax are of vegetable origin. Earth wax (ozokerite) is a mineral wax obtained during the distillation of paraffin oil. The difference between a wax and a fat is ascertained by saponifying them with alkalies: a wax will not eliminate glycerine, whereas a fat will produce that viscid sweet fluid. The correspondent who signs his letter "yours sincerely" may not be aware that he is literally making use of the term "wax," yet such is the case, for "sincere" is from the two words *sine cerâ*, which means "without wax." The origin of the word is curious, to wit: The old Roman jerry-builders used defective slabs of marble in erecting residences to sell at reduced rates, and covered up the defects with a cement of which white wax was the chief ingredient. This deception was discovered when an exceptionally hot sun melted the wax and revealed the fraud. Hence a perfect building was said to be *sine cerâ*, meaning "without wax"; and a friendship perfected by the trials of adversity was said to be "without wax." The signature *sine cerâ*, as a symbol of general affection and probity, has been used ever since, and is perpetuated in the English word sincerity. Sincerity in Carlyle's ethics is the one test of all worth in the human being; that he really in his whole soul means what he is saying and does, and is consequently ready to front time and eternity at the stake.

Colouring Matters for Sealing-waxes.

The preceding substances form the resinous portion of the sealing-waxes; those which follow are for giving colour, tint,

and weight, and for cheapening purposes. The colouring substances are as follows:—

For Red Waxes, vermilion, which is sometimes called cinnabar; but as native cinnabar is scarcely obtainable as a commercial product, the more familiar name vermilion is used for the finer waxes. Vermilion is a sulphide of mercury obtained by very tedious process. It is a very heavy, dense, light-red powder; but owing to its density or specific gravity, it sinks down in the resinous mass unless the same is constantly stirred until the wax is finished. The high cost of vermilion necessarily prohibits its use except in the production of the best-quality waxes. One of the means of lessening the cost of such waxes is to mix the vermilion with some white inert body. Carbonate of magnesia is usually used for best-quality waxes; whilst precipitated sulphate of barium, gypsum, or levigated chalk is used for the medium qualities. It is best to mix these inert compounds with the colouring matter in the dry state, and then make into a stiff paste with oil of turpentine, and gradually incorporate this paste with the molten mass of shellac, Venice turpentine, and colophony. Owing to the volatile nature of the essential oils, if they are used for perfuming the waxes they should be added to the molten mass when all the ingredients are incorporated and just before ladling it out for rolling or moulding into sticks.

Red Lead or Minium is the next important red colouring matter. This is used for the cheaper kinds of sealing-waxes, being much less costly than vermilion and giving a product almost as good in appearance and other qualities. This pigment is a red oxide of lead, being very dense, heavy, and of a bright red colour, almost equalling vermilion in hue. For the commonest waxes, such as parcel waxes, red ochre, col-

cothar, and other red oxides of iron are used instead of the above red pigment; while for bottling wax, red earths, such as bole, are frequently employed.

For Black Waxes the colouring matter consists of the finest lamp black or carbon black. The latter substance is a much better one than the lamp black, because it is free from tarry matter and, moreover, is of a finer texture or degree of amorphousness. Carbon black is the product obtained from the burning of petroleum and other hydrocarbon fluids; whereas ordinary lamp black is the soot obtained by burning fats, greases, oils, &c. As a consequence the latter substance is seldom free from tarry matters, except when made on a commercial scale in properly constructed chambers. For the commonest black waxes ordinary soot is not infrequently used.

Vine Black is a vegetable charcoal and is used in making superior waxes, while bone black is animal charcoal, and is only employed in making very common waxes.

As regards Yellow Sealing-waxes the choice of pigment is limited, because chrome yellow, although so rich in variety of tints, cannot well be used, because it changes colour on being heated. The yellow pigment most frequently employed is that known as king's yellow, which is a sulphide of arsenic. The yellow and orange chromates of cadmium would be too expensive to use, but king's yellow is a good substitute, although it is not a very deep yellow. It is a dense pigment, very heavy and poisonous; it is only used for the finer-quality sealing-waxes, yellow ochre being used for the commoner grades.

The Green Pigments are the green oxides of chromium.

These pigments will stand any temperature without changing colour. They are dense, of a good medium green to a rich transparent green, and fairly cheap in price. Emerald green, which is a compound of copper and arsenic, is used for bright light-coloured greens, but is liable to lose its colour if heated too strongly. For the cheaper-quality waxes mixtures of Prussian blue and chrome yellows are employed, or else ultramarine and yellow ochre.

For Blue Sealing-waxes ultramarine blue, cobalt blue, mountain blue (carbonate of copper), and Berlin blue, or Prussian blue is used. Ultramarine blue is obtained in a variety of tints and at various prices, low enough to allow it to be used for common waxes. Cobalt blue is a unique-toned blue, unlike any of the others, and is somewhat expensive; but smalt, which is an inferior grade of cobalt blue, is sometimes used for common waxes. Berlin or Prussian blues are cheap, but are liable to change to a brown tone if heated too strongly.

For Brown Sealing-waxes.—Brown earths, such as umber and mixtures of yellow ochres, and red pigments are employed, the choice of which is at the discretion of the maker according to the quality of the waxes he desires to produce. The inert substances used as cheapeners and for the purpose of compounding with the colouring matter to vary the tint are sulphate of barium, native and precipitated—the latter being used for the better-quality waxes, native sulphate of calcium (gypsum), chalk (carbonate of calcium), carbonate of lead (flake white), and ordinary white lead (carbo-hydrate of lead).

Carbonate of magnesia is used only for the best-quality waxes. The white powder magnesia (*i.e.*, oxide of magnesium) is also sometimes used instead of the carbonate;

but zinc white is almost as good and much cheaper, and although it turns slightly yellow when heated it regains its white tone when cold.

The above are the chief ingredients used in making sealing and other waxes, but a few other less important materials will be found mentioned in the recipes.

CHAPTER II.

THE MANUFACTURE OF SEALING-WAXES.

THE QUALITY OF SEALING-WAXES—METHODS OF MAKING SEALING-WAXES—THE POLISHING THE STICKS—RECIPES AND MANUFACTURE OF SEALING-WAXES—AVENTURINE SEALING-WAXES—BLACK SEALING-WAX, SUPERIOR, 3 R—COMMON BLACK SEALING-WAXES, 5 R—SUPERFINE BLACK SEALING-WAXES, 3 R—COMMON BLUE, 6 R IN ALL—CHEAP SEALING-WAXES FOR COMMON USE, 2 R—CRIMSON RED SEALING-WAX—ROSE RED SEALING-WAX—COLOURLESS SEALING-WAX—CHOCOLATE BROWN SEALING-WAXES, 2 R—BROWN SEALING-WAXES, 4 R—DEED SEALING-WAXES, 3 R—GREEN SEALING-WAXES, ORDINARY, COMMON, AND SUPERIOR—GREEN BRONZE SEALING-WAXES—LIGHT GREEN SEALING-WAXES—GOLD SEALING-WAXES, 5 R—GOLDEN BROWN SEALING-WAXES—GOLD SPANGLED SEALING-WAXES, 2 R—GOLDEN ORANGE, LIGHT AND DARK, WAXES—MARBLED SEALING-WAXES—RED SEALING-WAXES, 6 R—EXTRA SUPERFINE RED SEALING-WAXES, 2 R—SUPERFINE RED, FINE RED, 5 R—MEDIUM FINE RED SEALING-WAXES, 5 R—ORDINARY RED SEALING-WAXES, 4 R—COMMON RED SEALING-WAXES, 3 R—PERFUMED RED SEALING-WAX, 4 R—WAX FOR DIPLOMAS—TRANSPARENT SEALING-WAXES—VIOLET SEALING-WAX—WHITE SEALING-WAXES, 2 R—YELLOW SEALING-WAX, 4 R—PARCEL WAXES AND RED DITTO, 5 R—BLACK BOTTLE WAX, 5 R—BROWN PARCEL WAX, 2 R—COMMON CHEAP BOTTLING WAX, 2 R—MISCELLANEOUS BOTTLING WAXES.

No. 1.—NOTES CONCERNING THE PRODUCTION OF SEALING-WAXES.

THE QUALITIES OF SEALING-WAXES.

A GOOD sealing-wax is smooth on the outside and of even fracture when broken, that is, no vesicles or air-holes are seen in the fractured parts. A stick of wax should not be too

brittle, but should be glossy on the outside. It should not possess too much rosin. To test the qualities of sealing-wax:—If it runs, that shows the wax is of an inferior quality and contains too much rosin. Good wax will melt without dropping or charring, and will retain, after cooling, a certain amount of elasticity. The colour of the wax must not change by melting. Some colours, such as chrome yellow, change by heating: these colours are best avoided in colouring the wax. The hot wax should cool rapidly, not adhere to the seal, but should be readily detached and leave a sharp and clear impression.

Instead of adding the oil of turpentine to the molten mass of shellac and rosin, it is best to mix the colouring matter to a paste with the oil of turpentine, because such paste will become better incorporated with a molten resinous mass.

Sealing-waxes are perfumed with gum benzoin, balsam of Peru, musk, mastic, &c.

A mixture of 2 per cent. of benzoin in 1 per cent. of Peruvian balsam imparts a very fragrant odour; the addition of essential oils or ottos also imparts agreeable fragrance.

Superfine sealing-waxes are obtained by using only the very best materials, and extra superfine scented by adding 1 per cent. of Peruvian balsam or liquid storax to the ingredients when they have considerably cooled. The variegated and fancy-coloured waxes are usually perfumed with essence of musk or ambergris.

To cause sealing-wax to burn easily, a little camphor or spirits of wine may be added to the other ingredients.

METHOD OF MAKING SEALING-WAXES.

To produce a good-quality sealing-wax: (1) Too much rosin must not be present; (2) all the ingredients must be

dry; (3) always add the ingredients in the order prescribed; (4) use a good-quality shellac.

The process to be followed in mixing is to first melt the shellac, then stir in the turpentine, being careful to keep the temperature as low as possible—only just sufficient, in fact, to keep the mass in a molten state—then if any neutral substances, such as chalk or magnesia, are added, they should be put in, and afterwards the colouring pigment; and when these are well incorporated the volatile oil and balsams are stirred in just before forming the mixture into sticks. In adding the colouring matter it should be warmed before pouring it into the molten mass. When it is desired to produce any particular shade of colour by mixture of several pigments, a neutral substance should be mixed with the pigments instead of putting them in the molten mass, and this mixture of pigment and neutral substance should be made hot before pouring it in the molten shellac. The melting of the ingredients is carried out at the lowest possible temperature, so as to prevent the inflammable vapour given off becoming ignited. If these vapours do catch alight they should be extinguished at once by putting a cover over the melting bath, so as to prevent all access of air to the burning mass. Such inflamed mass, however, is only useful for dark-coloured waxes, or, if too much burnt, for bottle or parcel wax. The average quantity operated on at any one time is 20lb. to 25lb. of the mixed ingredients; but in the case of any one who has not attempted the manufacture of sealing-waxes before, a much smaller quantity should be operated on.

The melting vessel is of various shapes, some makers using enamel pots, others a long metal trough which has a double lining, the outer lining preventing the ingredients being overheated. One of the best forms of melting vessels is a trough 3ft. or 4ft. long, 8in. or 10in. wide at the bottom, and 1ft. high and 12in. or 14in. wide at the top. This

trough should have a false bottom, below which is a row of gas-jets. As it is necessary to use a separate melting vessel for each colour, these troughs should not be too large, and should also be capable of being removed from the source of heat when required for cleansing. As the sealing-wax mass adheres to the metal whilst hot, it is advisable to allow the vessel to become quite cold before attempting to clear it for a new batch of wax.

The process of incorporating the ingredients consists of first melting the shellac at a gentle heat and stirring it the whole time, then adding the turpentine and well mixing it with the molten shellac, after which add the neutral substances and then the colours and fine powder, pouring them in in a thin stream and constantly stirring so as to cause the pigment to become incorporated with the shellac. Stir the mixture until the ingredients are all mixed together, then test the compound by lifting a little out on the end of the stirrer and allowing it to drop on a cold iron plate. This drop should cool at once and not be too brittle, but give a good clean fracture when broken across. As a concluding test melt the drop in a flame and test its sealing qualities. If these tests prove the bulk of the mixture to be properly incorporated, then add the perfumes while keeping the whole in a fluid condition. Then the mass is ready to be formed into sticks for use.

The old-fashioned way of forming the sticks before moulds were invented was to lift out a spoonful of the mixture from the melting trough, pour it on a warm plate of iron and allow it to cool until it could be rubbed between the hands roughly into a cylindrical form, then this stick was laid on the warm iron plate and rolled backward and forward under a piece of wood until of the proper diameter. The moulds required for forming sticks are made of tin or brass, being a special form for

triangular or rectangular sticks; but for oval or round ones the moulds are made in two pieces; the size of the mould is double the length of the sticks. For rectangular sticks the forms or moulds are made $\frac{1}{25}$in. wider at the top than at the bottom, so as to permit the removal of the stick of wax. To impress the maker's name on each stick the letter is represented in intaglio in the metal mould, and such mould must be made in two pieces, viz., to open down the sides, so that the stick of wax, after being made, is removed by opening the mould instead of pushing it out through the end. If the lettering is to be gilded or silvered, then gold or silver powder is placed carefully in the lettered portion of the mould before the wax mass is put in.

To facilitate the removal of the finished stick from the lettered mould it is usual to smear the inside of the latter with oil of turpentine by means of a feather before pouring in the molten wax. After the wax is put in the moulds the sticks are cooled. To prevent them becoming too brittle it is best to cool them gradually; but if required to be quickly cooled, the moulds are laid on a metallic tray placed over a dish of cold water. This rapid cooling causes the sticks to slightly contract and be easily removed from the mould.

The Polishing of the Sticks

—is the next step in the process. This gives a finish to the sticks of wax, although in the finer qualities they exhibit a lustrous surface without adventitious polishing or enamelling as it is called. To impart this lustrous finish to the sticks a special form of stove is made use of, consisting of a kind of hot plate covering a vault with an ordinary open grate beneath.

The operation of polishing consists in taking a double stick in one hand and thrusting one-half of it into the hot

air of the vault or stove, holding it there until the stick partially melts and shows signs of bending. It is then withdrawn and swung about in the cold air of the room until it is rigid again. Then the other end is placed in the stove and the operation repeated. By the partial melting of the stick the surface acquires a brilliant lustre. If any part is to be gilded, silvered, or bronzed, such part is rubbed over with a brush dipped in methylated spirit, and the gold or silver applied before the stick has time to cool. The polished sticks are laid one by one on a cold plate and allowed to become thoroughly dry, and when the batch of sticks are all finished a nick is made in the middle of each with a file, and the double stick snapped across, and the fractured ends just held over a gas flame for a second to melt the wax to hide the fracture. The sticks are then wrapped up in tissue paper for the finer qualities and then put in boxes for sale.

Aventurine Sealing-wax.

By mixing gold or silver leaf or other metallic foils with the following ground mass, translucent waxes are obtained in which the metallic foils appear variously coloured.

No. 1.
- 8 oz. bleached shellac.
- 8 ,, Venice turpentine.
- 16 ,, mastic resin.
- 5¼ ,, chalk.

No. 2.
- 3 parts bleached shellac.
- 4 ,, Venice turpentine.
- 5 ,, mastic resin.
- 3 ,, precipitated sulphate barium (or else 3 oz. nitrate of bismuth).

Black Sealing-wax, Superior.

No. 1.
6 parts shellac.
2 ,, Venice turpentine.
3 ,, ivory black, finely powdered.

No. 2.
32 oz. shellac.
16 ,, colophony.
16 ,, ivory or carbon black.

No. 3.
2½lb. shellac.
1 ,, Venice turpentine.
2 oz. colophony.
10 ,, carbon black
Oil of turpentine, *q.s.*

Make the carbon black into a paste with sufficient oil of turpentine and stir this into the molten resinous mass composed of the other three ingredients.

Common Black Sealing-wax.

No. 1.
3 parts rosin.
1 ,, ruby shellac.
1 ,, Venice turpentine.
Lamp black, *q.s.*

No. 2.
5 parts shellac.
4 ,, colophony.
3 ,, levigated chalk.
4 ,, carbon black.
1 ,, oil of turpentine.

No. 3.
1 lb. shellac.
¾ ,, oil of turpentine.
¾ ,, black rosin.
3 ,, chalk.
2 ,, gypsum.
7 ,, vine black.

No. 4. 12 parts shellac.
11½ ,, colophony.
13 ,, Venice turpentine.
7 ,, chalk.
2 ,, lamp black.
2 ,, brick dust finely powdered.
2 ,, asphaltum.

No. 5. 4 oz. Venice turpentine.
8 ,, shellac.
3 ,, colophony.
Lamp black and oil of turpentine, *q.s.*

Superfine Black Sealing-wax.

No. 1. 3¼lb. orange shellac.
2½ ,, Venice turpentine.
3 ,, colophony
Carbon black rubbed up in oil of turpentine, *q.s.*

Fine Quality.

No. 2. 10 oz. ruby shellac.
10 ,, Venice turpentine.
5 ,, bone black.

Instead of 10 oz. of Venice turpentine only 5 oz. may be used and 5 oz. of colophony in addition.

Ordinary Quality.

No. 3. 29 oz. ruby shellac.
18 ,, rosin.
19 ,, Venice turpentine.
7 ,, chalk.
31 ,, bone black

Blue Sealing-waxes.

Superior Quality.

No. 1. 14 oz. orange shellac.
12 ,, Venice turpentine.
7 ,, colophony.
2 ,, carbonate magnesia.
11 ,, levigated chalk.
45 ,, blue colouring pigment.

Common Quality.

No. 2. 2 lb. colophony.
1 ,, smalt.

Dark Blue.

No. 3. 3 oz. Venice turpentine.
7 ,, fine shellac, orange.
1 ,, colophony.
1 ,, mineral blue.

No. 4. 1 lb. shellac.
½ ,, Venice turpentine.
½ ,, Burgundy pitch.
1 ,, dammar resin.
2 oz. indigo.

Very Light Blue.

No. 5. 31½ oz. bleached shellac.
105 ,, Venice turpentine.
77 ,, mastic resin.
70 ,, calcined mica.
52½ ,, ultramarine blue.

Very Dark Blue.

No. 6. 24½ oz. bleached shellac.
42 ,, Venice turpentine.
21 ,, levigated chalk.
150½ ,, mastic resin.
14 ,, calcined mica.
84 ,, cobalt blue.

Cheap Sealing-waxes for Common Use.

No. 1. 2 lb. common beeswax.
6 oz. Venice turpentine.
2 ,, olive oil.
6 ,, red lead.

Melt the beeswax and mix in the other ingredients, then raise the compound to the boiling point, and finally stir it until almost cold. Then dip it in water, and while plastic roll up into sticks or mould into cakes.

No. 2. 8 parts rosin.
4 ,, shellac.
3 ,, Venice turpentine.
3 ,, red lead.

Crimson Red Sealing-wax.

133 parts shellac.
33 ,, colophony.
66½ ,, Venice turpentine.
50 ,, carmine.
3 ,, magnesia.
Oil of turpentine, *q.s.*

Mix the carmine and magnesia together and make into a paste with the oil of turpentine, and mix this paste with the melted resins.

Rose Red Sealing-wax.

61 parts shellac.
4 ,, Munich lake.
17½ ,, tin ash.
52 ,, flake white.
17½ ,, carbonate of lead.

Colourless Sealing-wax.

No. 1. 16 parts pale shellac.
5 ,, amber rosin or colophony.
8 ,, Venice turpentine.

Melt and mix. The mass is destitute of any colour, but may be coloured by stirring in a sufficiency of any pigment in fine powder.

No. 2. 11 oz. beeswax.
3 ,, Venice turpentine.
1 ,, Rhine oil.
5 ,, shellac.

Melt and mix.

Chocolate Brown Sealing-waxes.

No. 1. 1 lb. amber rosin.
10 oz. Venice turpentine.
1½ ,, orange shellac.
2 ,, carbonate magnesia.
6 ,, vermilion.
3 ,, burnt umber.

Melt the first three ingredients, and separately mix the last three ingredients by sifting through a sieve, then mix into the molten mass.

No. 2. 204 parts black rosin.
53 ,, colophony.
53 ,, Venice turpentine.
198 ,, chalk.
198 ,, red ochre.

Common Brown Sealing-waxes.

No. 3. 213 parts shellac.
112 ,, rosin.
142 ,, Venice turpentine.
37 ,, vermilion.
105 ,, gypsum.
24½ ,, lamp black.

No. 4. 217 parts shellac.
137 ,, rosin.
168 ,, Venice turpentine.
28 ,, red bole.
98 ,, gypsum.
28 ,, red lead.

No. 5. 250 parts shellac.
133 ,, Venice turpentine.
16½ ,, vermilion.
16½ ,, levigated chalk.
33 ,, burnt umber.
3 ,, magnesia.

No. 6. 233 parts shellac.
133 ,, Venice turpentine.
100 ,, colophony.
50 ,, tripoli powder.
8 ,, vermilion.
33 ,, chalk.
3 ,, magnesia.

Light Brown Sealing-wax.

7½lb. shellac.
4 ,, Venice turpentine.
1 ,, light brown ochre.
½ ,, vermilion.

Dark Brown Sealing-wax.

No. 1. 1 lb. ruby shellac.
3 ,, Venice turpentine.
2 ,, black rosin.
1 ,, gypsum.
1 ,, precipitated chalk.
1 ,, finely ground umber.

No. 2. 4 oz. Venice turpentine.
7½ ,, shellac.
1½ ,, brown ochre.

Deed Wax.

Ordinary Quality.

¾ lb. amber-coloured colophony.
7 oz. oil of turpentine.
6 ,, clarified tallow.
8 ,, levigated chalk.
6 ,, red lead.

Melt the colophony, add the turpentine, then stir in the tallow, and afterwards the chalk and red lead, which should be mixed separately.

Common Quality.

No. 2. ¾ lb. colophony.
6 oz. tallow.
¾ lb. oil of turpentine.
1 ,, chalk.
1 ,, red lead.

Superior Quality.

No. 3. 10 parts white wax.
3 ,, oil of turpentine.
2 ,, vermilion.
1 ,, gypsum.

Green Sealing-wax.

No. 1. Mix together equal weights of Prussian blue, orpiment (*i.e.*, king's yellow or yellow sulphide of arsenic), Venice turpentine, and shellac.

No. 2. 8 oz. amber rosin.
5 ,, Venice turpentine.
12 ,, shellac.
1 ,, carbonate magnesia.
1 ,, emerald green.

No. 3. 14 parts shellac.
16 ,, Venice turpentine.
8 ,, colophony.
3 ,, carbonate magnesia.
5 ,, Berlin blue.
5 ,, lemon or middle chrome yellow (or else green ultramarine instead of a mixture of blue and yellow pigments).

No. 4. 30 oz. shellac.
24 ,, Venice turpentine.
48 ,, colophony.
9 ,, gypsum.
12 ,, levigated chalk.
18 ,, mountain blue.
18 ,, yellow ochre.

Green Bronze Sealing-wax.

1 lb. amber rosin.
10 oz. Venice turpentine.
1½ lb. orange shellac.
3 oz. carbonate magnesia.
4 ,, gold bronze powder.
3 ,, emerald green.
Oil of turpentine, *q.s.*

Mix the last three ingredients to a paste and stir it in the molten resinous mass.

Light Green Sealing-wax.

No. 1. 259 parts shellac.
63 ,, colophony.
182 ,, Venice turpentine.
84 ,, chalk.
84 ,, emerald oxide of chromium.

No. 2. 192 parts shellac.
112 ,, Venice turpentine.
105 ,, colophony.
53 ,, gypsum.
84 ,, mineral blue.
112 ,, massicot.

Gold Sealing-waxes.

No. 1. ½ lb. amber resin.
5 oz. Venice turpentine.
¾ lb. shellac.
1 oz. carbonate magnesia.
3½ ,, gold bronze powder.
Oil of turpentine, *q.s.*

Mix the carbonate of magnesia and gold powder together and make into a paste with sufficient oil of turpentine, then mix this paste into the molten mass.

No. 2. 152 parts shellac.
159 ,, Venice turpentine.
104 ,, rosin.
7 ,, mastic resin.
12 ,, Dutch gold foil cut up.

No. 3. 12 parts shellac.
4 ,, light colophony.
2 ,, silver leaf, cut up fine.

No. 4. 217 parts shellac.
203 ,, rosin.
224 ,, Venice turpentine.
70 ,, chrome green (green oxide of chromium).
3½ ,, magnesia.
15½ ,, gold leaf cut up fine.

Gold Spangled Sealing wax.

No. 1.
1 lb. pale orange shellac.
5 oz. Venice turpentine.
12 ,, mica spangles.

Melt the shellac at a low heat in a copper vessel, warm the Venice turpentine and stir that in, then add the mica, mix well, and mould the mass into sticks. When cold the brown colour of the shellac will give a gold colour to the mica spangles.

No. 2.
4 oz. Venice turpentine.
8 ,, shellac.
14 ,, sheets genuine gold leaf.
½ ,, bronze powder.
½ ,, magnesia.
Oil of turpentine, *q.s.*

Golden Brown Sealing-wax.

1 lb. amber resin.
1½ ,, shellac.
10 oz. Venice turpentine.
2 ,, carbonate magnesia.
4 ,, umber.
3 ,, yellow ochre.
Oil of turpentine, *q.s.*

Heat the yellow ochre on a sheet of iron until it changes into a rich brown or slightly pinkish colour, then mix the umber and magnesia and make the whole into a paste with sufficient oil of turpentine, and mix this paste with the melted resin.

Golden Orange Sealing-wax.

217 parts shellac.
140 ,, colophony.
112 ,, Venice turpentine.
35 ,, gypsum.
101 ,, red lead.
7 ,, magnesia.
59 ,, chrome yellow.

Marbled Sealing-waxes

—are obtained by mixing together two or three different kinds of coloured waxes while still in a plastic condition. A very effective novelty is obtained by rolling out into separate cakes a portion of red, white, and blue, cutting these cakes into strips, laying three coloured strips on a hot plate until just plastic enough to handle, then giving the strip a twist so as to make each colour curl round the other in a spiral form, when a stick of wax, red, white, and blue, is obtained.

Superior Red Sealing-waxes.

No. 1. Equal weights of shellac, colophony, precipitated chalk, and vermilion.

No. 2. 1½lb. orange shellac.
1 ,, Venice turpentine.
18 oz. vermilion.
4 ,, oil of turpentine.
6 ,, carbonate magnesia.

Mix the vermilion and carbonate of magnesia together by sifting, make into a paste with oil of turpentine, then incorporate this paste with the molten mass of shellac and Venice turpentine.

No. 3. 30 oz. shellac.
18 ,, Venice turpentine.
3 ,, oil of turpentine.
3 ,, levigated chalk.
6 ,, carbonate magnesia.
1½lb. vermilion.

No. 4. 2½lb. shellac.
¼ ,, Venice turpentine.
2 oz. oil of turpentine.
6 ,, chalk.
6 ,, gypsum.
1 ,, carbonate magnesia.
1½lb. vermilion.

Mix the last four ingredients together and make into a paste with the oil of turpentine, and stir this into the molten mass of shellac and Venice turpentine.

No. 5. 3 lb. shellac.
3¼ ,, Venice turpentine.
1 oz. Peruvian balsam.
50 ,, vermilion.

No. 6. 1½lb. shellac.
1½ ,, colophony.
30 oz. Venice turpentine.
2½lb. vermilion.
½-pint methylated spirits.

Extra Superfine Red Sealing-wax.

No. 1. 233 parts shellac.
133 ,, Venice turpentine.
83 ,, vermilion.
8 ,, levigated chalk or carbonate of magnesia.
Oil of turpentine, *q.s.*

No. 2. 2 lb. shellac.
1 ,, colophony.
1 ,, vermilion.

Superfine Red Sealing-wax.

No. 1. 4 lb. best orange shellac.
1¼ ,, Venice turpentine.
3 ,, vermilion.

No. 2. 216 parts shellac.
133 ,, Venice turpentine.
16 ,, colophony.
83 ,, vermilion.
3 ,, chalk.
Turpentine, *q.s.*

No. 3. 58 parts shellac.
87½ ,, Venice turpentine.
43 ,, vermilion.
3 ,, carbonate magnesia.
Oil of turpentine, *q.s.*

Fine Red Sealing-wax.

No. 1. 55 oz. shellac.
74 ,, Venice turpentine.
30 ,, carbonate magnesia.
20 ,, zinc white.
13 ,, vermilion.

An inferior-quality wax is made by replacing the magnesia with levigated chalk and the zinc white with gypsum.

No. 2.
2 lb. shellac.
3 ,, rosin.
3 ,, Venice turpentine.
¼ ,, oil of turpentine.
1 ,, chalk.
½ ,, gypsum.
2 ,, vermilion.

Medium Fine Red Sealing-waxes.

No. 1.
1 lb. shellac.
8 ,, Venice turpentine
½ ,, oil of turpentine.
3 ,, chalk.
1 ,, carbonate magnesia.
6 ,, vermilion.

No. 2.
¾ lb. shellac.
½ ,, colophony.
3 oz. oil of turpentine.
14 ,, Venice turpentine.
3 ,, chalk.
3 ,, gypsum.
9 ,, vermilion.

Mix the last three together by sifting, make into a paste with the oil of turpentine, then incorporate with the molten resinous mass.

No. 3.
200 parts shellac.
133 ,, Venice turpentine.
75 ,, colophony.
3 ,, chalk.
58 ,, vermilion.
Oil of turpentine, *q.s.*

No. 4. 240 parts shellac.
130 ,, Venice turpentine.
50 ,, calcined gypsum.
40 ,, magnesia.
133 ,, vermilion.
11½ ,, oil of turpentine.

No. 5. 177 parts shellac.
233 ,, Venice turpentine.
100 ,, chalk.
63 ,, gypsum.
43½ ,, vermilion.

Ordinary Red Sealing-waxes.

No. 1. 13 parts shellac.
13 ,, Venice turpentine.
11 ,, colophony.
4½ ,, chalk.
4½ ,, vermilion.

No. 2. 4 parts rosin.
1 ,, Venice turpentine.
3 ,, red lead.

No. 3. 1 lb. rosin.
½ ,, shellac.
3 oz. Venice turpentine.
3 ,, red lead.

No. 4. 106 parts shellac.
53½ ,, colophony.
133½ ,, Venice turpentine.
26½ ,, gypsum.
163 ,, vermilion.

Common Red Sealing-waxes.

No. 1. 183 parts shellac.
133 ,, Venice turpentine.
50 ,, common rosin.
40 ,, red lead.
3 ,, chalk.
Oil of turpentine, *q.s.* to make a paste.

No. 2. 142 parts shellac.
152 ,, common rosin.
210 ,, Venice turpentine.
63 ,, chalk.
63 ,, red lead.

No. 3. 200 parts shellac.
133 ,, Venice turpentine.
50 ,, rosin.
50 ,, red lead.
3 ,, chalk.
Oil of turpentine, *q.s.* to make a paste.

Perfumed Red Sealing-wax.

No. 1. ½ lb. amber rosin, powdered.
5 oz. Venice turpentine.
12 ,, shellac.
3 ,, vermilion.
1 ,, carbonate of magnesia.
1 drachm benzoic acid.

Mix the vermilion and magnesia carbonate and stir this into the melted mass of rosin, then add the perfume, stir well and put into moulds.

No. 2. 4 oz. Venice turpentine.
6 ,, shellac.
¾ ,, colophony.
1¾ ,, vermilion.

Perfume with ambergris.

No. 3. 4 oz. Venice turpentine.
5½ ,, shellac.
1½ ,, colophony.
1¼ ,, vermilion.
Carbonate magnesia, *q.s.*

Perfume with essence of musk. Mix the magnesia to a paste with the oil of turpentine.

Soft Wax for Sealing Diplomas.

1½lb. yellow wax.
4½oz. Venice turpentine.
1½ ,, olive oil.
Colouring matter, *q.s.*

Melt and mix the first three ingredients and then stir in the colouring matter.

Transparent Sealing-wax.

3 lb. bleached shellac.
3½ ,, Venice turpentine.
4 ,, mastic rosin.
2 ,, zinc white.
Bronze powders, *q.s.*

Mix the bronze powders with the zinc white in the dry condition, then make into a paste with turpentine, and stir this into the molten mass of rosin. Metallic foils cut up fine can be used instead of the bronze powders.

VIOLET SEALING-WAX.

245 parts shellac.
125 ,, Venice turpentine.
79 , mineral blue.
52 , carbonate of lead.
35 , flake white.
9 , Muffich lake.

WHITE SEALING-WAXES.

No. 1. Mix together in the usual way equal weights of dry white lead, colophony, Venice turpentine, and shellac.

No. 2. 104 parts bleached shellac.
56 ,, Venice turpentine.
38½ ,, Spanish chalk.
49 ,, carbonate of lead.
3½ ,, magnesia.
70 ,, dry white lead.

YELLOW SEALING-WAX.

No. 1. 16 oz. medium chrome yellow.
16 ,, Venice turpentine.
16 ,, shellac.

No. 2. 2 oz. Venice turpentine.
4 ,, shellac.
1½ ,, colophony.
¾ ,, king's yellow.

No. 3. 3 lb. Venice turpentine
3½ ,, shellac
3 ,, massicot

No. 4. 133 oz. shellac.
66½ ,, Venice turpentine.
41½ ,, colophony.
24½ ,, massicot.
2½ ,, magnesia rubbed up with oil of turpentine, *q. s.*

Red Parcel Waxes

No. 1. 14 oz. shellac.
26 ,, rosin, common.
20 ,, Venice turpentine.
2 ,, oil of turpentine.
2 ,, chalk.
4 ,, gypsum.
10 ,, vermilion or red lead.

No. 2. 12 oz. shellac.
48 ,, rosin.
30 ,, Venice turpentine.
3 ,, oil of turpentine.
18 ,, chalk.
32 ,, gypsum.
36 ,, red lead.

No. 3. 1½lb. shellac.
8½ ,, rosin.
6 ,, Venice turpentine.
8 oz. oil of turpentine.
2 lb. chalk.
1 ,, brick dust.
5 .. red oxide of iron.

No. 4. 50 parts shellac.
33½ ,, Venice turpentine.
Red lead, *q. s.* to colour.

No. 5. 133 parts shellac.
100½ ,, rosin.
83 ,, Venice turpentine.
100 ,, chalk.
1 ,, vermilion.

Black Bottle Wax.

No. 1. 6½lb. rosin.
½ ,, beeswax
1½ ,, ivory black.

Melt together. Other colours can be obtained by replacing the ivory black with an equivalent quantity of suitably coloured pigment.

No. 2. 2 lb. white pitch.
4 ,, yellow wax.
4 ,, colophony.
2 ,, Venice turpentine.
Lamp black, *q.s.*

No. 3. 6 lb. black rosin.
½ ,, yellow wax.
1½ ,, lamp black.

Black Bottling Wax.

3 lb. ceresine.
28½ ,, lamp black.

For other colours make a mixture of shellac and paraffin waxes in the above proportions, and then add colouring matter to the extent of 5 to 7 parts per 100 parts of the resinous mixture.

Blue Bottling Wax.

10 parts colophony.
2 ,, Venice turpentine.
2 ,, yellow wax.
2 ,, ultramarine blue.

This compound can be coloured *red* by replacing the ultramarine with 2 parts red ochre; or it may be coloured *green* by a mixture of 1 part Berlin blue and 1 part yellow chromate of zinc.

Brown Parcel Wax.

No. 1. 1¼lb. colophony.
10 oz. common rosin.
5 ,, Venice turpentine.
7½ ,, chalk.
½ ,, oil of turpentine.
10 ,, umber.

Very Dark Brow

No. 2. 214 parts shellac.
105 ,, Venice turpentine.
91 ,, asphaltum.
147 ,, chalk.
112 ,, burnt umber.

Common Cheap Bottling Wax

24 parts rosin.
6 ,, colcothar.
1 oz. soft soap.

Melt the rosin, mix in the soft soap, a little at a time so as to allow the frothing to subside before adding further quantity, then stir in the colouring matter, gently heat the mixture, and stir well.

Bottle Wax.

No. 2. 2½lb. common rosin.
1 ,, ceresine wax.
½ ,, lard.

Mix together, then add any suitable colouring matter.

Miscellaneous Bottling Waxes.

Take 10 parts of any coloured bottling wax, melt it and mix in 1 to 2 parts of mica or bronze powder. This will be a bronzed-coloured wax.

Bottling Wax for Spirituous Liquids.

1 part yellow wax.
2 ,, rosin.
2 ,, pitch.

Melt together and dip the neck of the bottle into the liquid compound, give it a twirl in the hands and it will dry at once.

Substitute for Bottle Wax.

4 parts gypsum.
6 ,, white cement.
3 ,, chalk.
2 ,, dextrine.
50 ,, spirit varnish.
Colouring matter, *q.s.*

Mix together and dip the neck of the bottle in it.

Sealing Compound for Acids and Volatile Liquids.

Mix together equal weights of linseed meal and precipitated chalk, and rub up to a paste with a little water in a mortar. Almond meal instead of linseed meal may be used. This compound is a useful one for luting round the stoppers and corks of bottles and carboys containing the above fluids.

CHAPTER III.

WAFERS.

METHOD OF MAKING FLOUR WAFERS—BLACK, RED, ROSE, BLUE, YELLOW, AND GELATINE WAFERS.

WAFERS

—are articles comparatively unknown to the present generation. Time was, however, when every letter was fastened with a wafer. The earliest experience the writer had of wafers was one that caused him never to forget them. He found some variously coloured discs in his grandfather's desk; child-like the colour attracted him, and from admiration of the bright colours to the nibbling of the discs to taste their flavour was but a simple step. The next one, however, was the visit of the doctor; for, as I had not been discriminate in my taste and had swallowed a few wafers of each colour, I apparently had chewed up a modicum of arsenic, red lead, indigo, vermillion, and emerald green, these being the materials that had been used to impart a yellow, red, blue, purple, and green colour to the wafers. I have never had an inclination to taste them since.

Before the introduction of gummed envelopes the letter sheet was folded, the ends doubled in, and a corner fastened by a wafer, the address being written on the outside of the letter itself. If a further protection against prying eyes was needed, the letter was sealed with sealing-wax; but as the

cost of postage at the period when wafers were commonly in use was very heavy, it was not always economical to increase their weight by a lump of sealing-wax.

At the present day wafers are seldom seen outside a lawyer's office, but the sealing-wafers he uses are not like those under notice, but are mere discs of red papers which are affixed to documents as a seal against one's sign manual. The wafers which were formerly used for sealing letters were composed of flour and water, coloured usually with mineral colours. They were simply moistened and then stuck on between the folded covers of a letter, and by pressure the wafer would dry and cause the paper to adhere.

The utensils required for making

Flour Wafers

are the following:—

A waffle iron—this is like a pair of flat pincers, which, when closed, leave a small interior space which holds the flour paste—a charcoal fire or gas stove, wheat flour, and harmless colouring matter. As the wafer will be probably moistened with the tongue, mineral and poisonous colouring matter must not be used. Only simply coloured fluids of a harmless nature can be safely used for colouring the flour pastes.

The Process of Manufacture

—consists in mixing fine wheat flour with cold water, straining through a cloth so that there are no clotty particles, colouring this fluid paste with a little of a suitable colouring fluid, and then filling the wafer iron or waffle with the paste and holding the iron over the heat of a charcoal fire for a short time; the irons are then allowed to cool before opening them. When the wafer cake is removed, it is in a dry, solid,

brittle state about the thickness of a piece of blotting paper. The sheet is cut up into discs with annular cutting punches. Before pouring the flour paste into the iron, the interior surface of the latter should be smeared with butter or olive oil so as to prevent the pap burning or adhering to the iron.

The colouring matters for flour wafers are the following:—

BLACK.—Fine carbon black or a strong solution of Indian ink added to the flour pap.

WHITE WAFERS consist of the flour pap only, no colouring matter.

RED AND ROSE COLOURS are produced by a decoction of madder root or Brazil wood, or a cochineal solution to which a little alum has been added.

BLUE may be obtained by using a little finely-powdered Prussian blue.

PURPLE is obtained by a mixture of red and blue colouring matter.

YELLOW is obtained by a decoction of turmeric or weld, or a little tincture of saffron.

GREEN is obtained by a mixture of sulphate of indigo and turmeric.

GELATINE WAFERS

—are used for many purposes for which a simple adhesive is required. They are made by soaking gelatine in water and dissolving it alone or in conjunction with some isinglass. This fluid is then poured on a glass plate which has been

warmed by a steam heat and slightly greased, so as to prevent the gelatine mass adhering. A narrow rim or ridge, which regulates the thickness of the wafer, surrounds the plate. When the gelatine solution is poured on the plate, a second sheet of glass, also warmed and greased, is then laid on top so as to touch every part of the gelatine and rest on the rim of the lower plate. When the plate and contents have become cold the sheet of gelatine is easily removed and cut up into discs. These gelatine wafers are also coloured by colouring matters of a non-poisonous kind and of a transparent nature. For example *blue* is obtained by a solution of sulphate of indigo partly saturated with potash; tincture of saffron or turmeric being used for *yellows*, and a mixture of the above for *greens;* while a solution of Brazil wood, mixed with alum solution and strained, gives a red colouring matter.

The red paper wafers used by lawyers to plaster on documents as a kind of a seal consists of paper coloured red and varnished on one side, while the reverse side is coated with an adhesive solution such as dextrine, &c.

Sometimes metallic foil is coated on one side with an adhesive compound and cut into discs for use as wafers. To prevent the foil discolouring by exposure to the air, it is usually coloured with a coloured lacquer. A suitable adhesive for coating these metallic wafers is prepared as follows:—Heat together in a bottle at a temperature of 210° F. 16oz. of glue (previously softened by soaking in water), 4oz. gum arabic, 5oz. sugar or treacle, 3oz. alcohol, 1oz. camphor, 1oz. virgin wax, and 12oz. soft water. The heating of the mixture is continued for eight hours, when it is filtered and diluted with 1 part of alum in 15 parts water, keeping the temperature below 212° F. Any of the adhesive compounds given in this book for coating labels and for attaching metallic surfaces can also be used.

CHAPER IV.

NOTES ON THE NATURE OF THE MATERIALS USED IN MAKING ADHESIVE COMPOUNDS.

GUMS—GLUE—GELATINE—ISINGLASS—FLOUR.

NOTES ON THE NATURE OF THE MATERIALS USED FOR PREPARING ADHESIVE COMPOUNDS.

GUMS

—are the materials most generally used for producing mucilaginous adhesive compounds. There are many gums,* but there are only a few available for making adhesive compounds, of which gum arabic is most generally employed.

The following definition of gums will distinguish them from resins and other "mis-called" gums. A gum proper will dissolve in water and not in alcohol, whereas a resin will dissolve in alcohol, but not in water; water, in fact, will precipitate the resin from an alcoholic solution. A balsam, however, is a compound which is partly soluble in water and partly in alcohol, but can only be completely dissolved in a mixture of these two fluids. There are several kinds of gum arabic; the genuine gum acacia is the best but dearest. Turkey gum or Bassora gum will not completely dissolve in water, and is of very little use for forming an adhesive compound. The most useful variety of gum arabic is that known as gum Senegal. It is much clearer than the gum arabic,

* Resins are often, but erroneously, called "gums" by the varnish makers.

sometimes entirely colourless, and also is obtained in large size pieces. It is not necessary to go into details concerning the physical and chemical characteristics of gum arabic, suffice it to say that it is dissolved by slow digestion in cold water, and more quickly in hot water, and that the mucilage thus made can be used in the fluid form or spread and dried on any surface, and simply by moistening such coating with cold water the material will adhere to any surface. But as it dries brittle, glycerine or sugar should be added when an elastic or flexible coating is required.

The addition of sulphate of alumina free from iron (not common alum) to gum arabic mucilage will greatly increase the adhesiveness of such mucilage. Gum tragacanth (more commonly called by drysalters "gum dragon") is of a totally different nature to the above gum. Gum dragon takes many days before completely dissolving in water, especially if the leaf gum be employed for making the mucilage. The powdered gum dragon, however, dissolves in a shorter time, particularly if rubbed up in a mortar with about 5% of its weight of glycerine before digesting in water. Cold water is the best solvent medium. By the addition of a few per cent. of oxalic or sulphuric acid to the water in which gum dragon is digested it will swell up and dissolve at a much quicker rate than in water alone. Any whitish large pieces in the mucilage are portions of the gum which have not completely dissolved; they should therefore be picked out, or else the mucilage strained through a linen filtering bag. A coating of gum dragon applied to a surface dries very stiff and harsh, therefore this mucilage is not always adaptable as an adhesive by itself alone; it readily, however, mixes with oils and other bodies to form useful adhesive compounds, imparting a contractile quality to them which they would not otherwise exert. The only other gum that needs special mention in this section is British gum, more commonly

called "dextrine." This is not a natural gum or exudation from a tree, but is a product artificially obtained by mixing a little diluted nitric acid with starch powder, and baking the paste thus formed at 152° F., when the brittle cake resulting is reduced to powder, and again dried at a stove heat. The product thus obtained is yellow, slightly sweetish, and not of an unpleasant taste—as any one who has licked a postage stamp will be aware, because dextrine mucilage is the adhesive used for coating such stamps. It is non-poisonous, very adhesive, and produces a very cheap mucilage. An artificial dextrine has been produced by the following means:- Mix 8oz. of crushed malt with 1 gallon of warm water, and heat the mixture to 145° F., then add 40oz. of farina (potato flour), increase the heat to 160° F., and mash for nearly half an hour, or until the liquid becomes thin and clear. Then at once run it off and raise it to the boiling point to prevent saccharine fermentation. Boil for three to four minutes, and then evaporate to dryness in a steam-heated drying closet.

Glue

—is one of the oldest materials used as an adhesive, but its full capabilities have never been worked out. For example, glue can be mixed with various bodies which impart qualities to it little suspected; thus, a simple solution of glue in water will not adhere to every kind of material; it will not, for example, attach textile materials to iron or other metals, nor to a smooth surface such as glass; whereas, by the incorporation of carbonaceous substances, as treacle, sugar, glycerine, or sawdust, glue compounds can be prepared well fitted to attach many different materials together. A perusal of the recipes given in this book will give many examples of such an adhesive compound.

Glue can be made to combine with such varied substances as turpentine, paraffin oil, linseed and other oils, soap, resins, &c., whereby elasticity, flexibility, and many other useful qualities are imparted to such glue compounds.

Glue is produced by boiling down "offal" of cattle, such as horns, hoofs, cartilage, gristle, &c., in water several times. The gelatine solution first obtained yields the strongest adhesive product for best quality glue, the second and third boilings of the same glue-stock give inferior grades. The value of glue as an adhesive consists in its contractile power, consequently the best quality glues possess this contractile power in the greatest degree. To render glue capable of being used as an adhesive it is necessary to soak the hard (raw) glue in water and to dissolve the soddened glue by heating it over a water-bath (a common glue-pot forms a water-bath). If the glue was boiled in a vessel that was in direct contact with the source of heat, the glue would become burned and charred and rendered useless, as it would possess no adhesive qualities whatever.

The quantity of water that can be absorbed by glue is a rough test of its adhesive qualities; poor-quality glues, when soaked in water, lose their form and fall down to a jelly-like mass, whereas best grades will absorb two or three times their own weight of water without losing their cake form; consequently only a definite quantity of water can be used with glues according to their grade.

Another peculiarity about glue is that the more frequently the glue is heated in the glue-pot the less adhesive it becomes. If heated at a dry heat it dries to a hard, brittle, horn-like mass, which refuses to soften again in water.

As a solution of glue sets to a jelly and hardens when cold, it must be used whilst hot, the hotter the better, the principle of its adhesiveness being that as the glue cools it contracts, and this *ipso facto* causes the glued surface to

firmly adhere. Inasmuch as glue is soluble in water, the strongest glued joint can be pulled apart by soaking the joint with hot or cold water. Another defect of glue is that the coating applied as an adhesive becomes very brittle, and is therefore not applicable for attaching materials together where flexibility is a *sine quâ non*. The limits of this book preclude a lengthened disquisition on the chemical and physical qualities of glue, therefore the reader is referred to the recipes for glue compounds for further particulars, which show the modifications and different qualities that can be imparted to glue compounds by suitably incorporating other substances. Saccharine substances, such as glycerine, sugar, glucose, &c., will render a pot of ordinary glue flexible, elastic, and very adhesive. Glue prepared with the addition of such substances will, on exposure to the air, become like a tough piece of india-rubber in elasticity and quality of being stretched, therefore, for leather belting and machinery bands that require to bend, glue made in the ordinary way is useless unless sugar is added to it.

Again, the admixture of resinous bodies, such as Venice turpentine, with glue, will lessen its power of solution in water; consequently in such a combination we have a ready means of preparing a waterproof glue. Glue, we know, is insoluble in oils and spirituous fluids; but this fact has not been made full use of, as, for example, in the preparation of a glue compound that could be used as a paint for coating the inside or outside of barrels or tanks containing such volatile fluids as benzine, naphtha, carbon bi-sulphuride, &c. As the oxides of iron, zinc, &c., impart a very hardening quality to aqueous solutions of glue by a simple mixture of glue in water, with the addition of resin or Venice turpentine, and the incorporation of such oxides, or even lamp black, useful painting compounds could be prepared that would effectually prevent the escape of the highly inflam-

mable vapour from such volatile fluids; consequently the risk of fire from storage of such liquids would be minimised.

Gelatine

—differs from glue in its chemical nature, but in physical characteristics is very similar. This substance, like glue, requires to be soaked in cold water before being heated. If it be dissolved in hot water the solution will, when cold, set to a jelly which shows very little adhesive qualities. Such jelly will readily decompose instead of drying to a contractile mass. An admixture of glue and gelatine produces compounds that exhibit special qualities compared with either substance alone.

Isinglass

—is an agglutinate substance obtained by boiling fish-bones and skins in water. It swells up in warm water and forms an adhesive medium; but its best adhesive effects are observed when it has first been soaked in water and then dissolved in alcohol by general heating. Owing to the high price of isinglass the employment of such a compound is limited. By the incorporation of a resinous gum, such as gum ammoniac, a compound is produced which is insoluble in water, and such compounds form a useful adhesive for mending glass and china articles that are required to stand the action of hot fluids. The action of alcohol on isinglass and gelatine is to cause those substances to dry quickly and exert great contractile power. By the mixture of bi-chromate of potash on a solution of gelatine, the compound becomes insoluble in water after exposure to the sunlight.

Flour,

—as a material for producing adhesives, depends on the

gluten it contains. Gluten swells up in hot water to a jelly-like mass, and such jelly, on drying, contracts and causes coherence. To properly produce this glutinous mass it is necessary to first mix the flour to a paste or batter with a little cold water, and then cook the gluten by pouring on boiling hot water with constant stirring until the gluten thickens. If the water be below 200° F. the gluten will not be properly cooked.

Flour paste loses its adhesiveness by boiling the paste, because the gluten then becomes over-cooked and loses its adhesive quality. Wheat and rye flours are the usual ones used in making pastes and adhesives; but sometimes arrow-root, rice flour, potato starch, and flours of other cereals are used. Flour pastes are liable to decomposition due to fermentation occurring in the paste; but by the addition of antiseptic bodies, such a salicylic acid, carbolic acid, oil of cloves, and other essential oils, such decomposition is prevented and the paste remains sweet. Paste that has turned sour has lost its adhesiveness, such sourness being due to fermentation in the mass.

The addition of alum to flour paste increases its adhesive quality and enables it to stick to materials it would not otherwise do. So likewise with the addition of colophony or common rosin, also Venice turpentine. The process of incorporating these ingredients is as follows:—Dissolve the alum in the requisite quantity of cold water, and make the flour into a batter with this water, then pour boiling hot water on to the batter until it thickens.

When rosin is added to flour paste the paste is made in the usual way, and then the powdered rosin is put into the paste and the compound boiled for a short time.

The addition of Venice turpentine to flour paste is made by making the paste in the usual way, liquefying the Venice turpentine by heating it, and then putting it into the boiling

hot paste; boil and stir the mixture until the turpentine has become incorporated with the flour. The paste must not contain too much water, otherwise the Venice turpentine will not incorporate with it, but remain separated. The boiled paste must be allowed to cool slowly, otherwise separation of the Venice turpentine from the flour will occur.

CHAPTER V.

CEMENTS FOR USE IN THE HOUSEHOLD.

DIRECTIONS FOR APPLYING CEMENTS—ADHESIVE FOR ALABASTER AND MARBLE—WATERPROOF CEMENT FOR AQUARIUMS—DIAMOND CEMENT FOR GLASS AND PORCELAIN—A SIMPLE ADHESIVE FOR GLASS AND CHINA—ADHESIVE FOR RUBBER TYRES—CEMENT FOR EARTHENWARE AND STONE—CASEIN CEMENTS—METHOD FOR PRODUCING PURE CASEIN—CEMENT FOR POTTERY-WARE—CEMENT FOR EARTHENWARE—FLEXIBLE COLOURLESS CEMENT—ELASTIC CEMENT FOR RUBBER, GUTTA-PERCHA, LEATHER, &c.—CEMENT FOR COMMON GLASS-WARE—CEMENT FOR PARAFFIN LAMPS—CEMENT FOR MICROSCOPIC SPECIMENS—CEMENT FOR MEERSCHAUM PIPES—CEMENT FOR PLASTER-OF-PARIS CASTS—CEMENT FOR IVORY AND BONE—HOUSEHOLD CEMENT FOR GENERAL USE—CEMENT FOR TORTOISE-SHELL ORNAMENTS—CEMENT FOR STATUARY: PLASTER OF PARIS, STONE, AND MARBLE—LIQUID GLUE FOR HOUSEHOLD USE—WATERPROOF ADHESIVE FOR AQUARIUMS, FRESH AND SALT WATER—MOUNTANT FOR PHOTOGRAPHIC USE—PASTES FOR THE HOUSEHOLD—PASTE FOR WALL-PAPERS.

CEMENTS FOR USE IN THE HOUSEHOLD.

These adhesives are so very simple to make that every economical person will find it much more profitable to make his own china and glass cements than to buy a bottle of stuff, which after all may not prove suitable for the material to be cemented. To meet as large a number of cases as possible, the following selection of recipes is a fairly representative one. There are many articles in the household which can be kept in repair by means of a suitable cement. As a

rule, cements for mending china, glass, and other fragile articles are sold in small quantities at high prices; there is no reason why this should be so, except that it means a large profit to the manufacturer. Cement often fails to effect the purpose desired because it is not properly applied, therefore attention should be given to the following simple

Directions for Applying Cements.

No. 1.—Carefully clean the surfaces to be joined from all grease, dirt, &c. To effect such removal the article must be cleaned by suitable agents according to the material of which the article is made. For example, glass, porcelain, and earthenware can be cleaned by washing the surface in soap and water and freely rinsing with clean cold water and drying the surface before applying the cement.

If the articles to be repaired be of marble or alabaster, a caustic lye should be made by mixing a little lime with washing-soda crystals and boiling the mixture in water. Brush this over the surface to be cleaned with an old tooth-brush, and then swill off with plenty of water.

For grease and oil stains on wood and fancy articles the repeated applications of benzene by means of a sponge or sheets of blotting paper soaked in this fluid and laid on the stained parts will remove such grease stains.

To remove paint stains turpentine or turpentine and camphor is one of the best remedies to use.

In every case the surface, after removal of the dirt or stain, should be effectually freed from the removal agent.

No. 2.—When the surfaces to be cemented are cleaned they should be fitted to each other before applying the cement

so as to carefully note the best position in which to place the surfaces to make the strongest joint.

No. 3.—Some cements require to be applied hot, and such cements often fail to make a joint because they become chilled through being laid on a cold surface. Therefore, in using such cements the surfaces to be joined should be warmed. This is effected in many ways, according to the article; thus glass, china, and earthenware articles can be warmed by holding them in front of a fire or on a hot plate, or by dipping them into a vessel of hot water and wiping dry before applying the cement.

Articles that cannot be heated by these means can be warmed by passing a hot iron to and fro over the surfaces to be joined, being careful to keep the hot iron a few inches from the article so as to avoid scorching, burning, or otherwise injuring it.

No. 4.—Never use a thick layer of cement in joints, otherwise the joint will only be as strong as the cement itself, whereas if the jointed surfaces fit into each other and are held in such position by a mere film of a cement a very strong joint is the result, especially so in the case of glass or china where a cement like "Diamond" cement is used. In the case of earthenware, where a rosin and shellac cement is used, it is not possible to obtain a very thin layer, but the layer of cement should never be so thick as to prevent the surfaces coming in actual contact more or less.

No. 5.—Some cements require a considerable time before they set or harden. In such cases the cemented joint

should be kept in position by means of clamps, string, or other means of pressure applied until the cement sets.

Pressure is used so as to squeeze out all the air-bubbles entrapped by the cement, the presence of which would only weaken the joint.

No. 6.—All the excess of cement that is squeezed out should be removed from the edges of the joint before the cement has become quite dry, otherwise the efforts to remove such superfluity often result in breaking the joints again, in the case of some very hard-setting cements.

No. 7.—Never mix any colouring matter with the cement that will set up chemical reactions, or it will otherwise weaken the adhesive qualities of the cement.

No. 8.—Always select the right cement for the materials to be joined. This is not always an easy matter; but if a spare piece of the material is handy, it should be broken and then a trial of different cements made in rejoining the broken pieces and observation made as to which cement best fulfils the requirements of the case.

An Adhesive for Alabaster and Marble.

Take equal weights of colophony, beeswax, and dry plaster of Paris; melt the wax and add the colophony, and when that has become incorporated with the wax gradually add the plaster and stir the mixture until all is combined. Warm the surface of the joint and use the cement while hot and plastic.

Waterproof Cement for Aquariums.

Ingredients :—

6 parts of whiting.
3 ,, plaster of Paris.
3 ,, washed sea-sand.
3 ,, litharge.
1 ,, rosin.
Hard copal varnish, *q.s.*

Mix the first five ingredients together in the dry state by sifting, then make into a putty with the varnish and use like painters' putty. Give a week to 10 days to harden before filling the aquarium with water.

Diamond Cement for Fine Glass and China-ware, also called Armenian Cement or Jewellers' Cement.

Ingredients :—

1 oz. isinglass.
4 ,, water.
4 ,, alcohol.
½ ,, mastic in tears.
Dissolved in 4 oz. alcohol.
¼ oz. gum ammoniac.

Soak the isinglass in the water for a few hours and stand in a warm place, so as to hasten the solution; then heat up, to evaporate all unabsorbed water. Keep the isinglass mucilage hot, so that it shall not set solid. Separately dissolve the mastic resin in the other 4 oz. of alcohol to which add the gum ammoniac. When these two preparations are ready, add 4 oz. alcohol to the hot isinglass mucilage, and mix that with the mastic varnish, and heat the whole until it liquefies, standing the vessel in a water-bath. For use, it is re-melted over a water-bath and used hot.

A Very Simple Adhesive for China and Glass Articles

—consists in mixing equal parts of thick isinglass solution with mastic varnish made by dissolving mastic in methylated spirit; mix together while hot and apply at once.

Adhesive for Rubber Tyres.

Put into a bottle having a glass stopper which has been smeared with vaseline 4 oz. of Para rubber, 2 oz. of gutta-percha, 1 oz. of isinglass which has been soaked in water and then dissolved in alcohol, then pour on the mass 2 oz. of carbon bisulphide, and then allow the whole to macerate until a homogeneous mass is produced.

A Slow-setting Cement for Earthenware and Stone Articles

—is made by adding sufficient precipitated chalk to a solution of silicate of soda of 30° Bé. until a stiff paste is produced. Keep the joint under pressure until the adhesive is firm and hard.

Casein Cements

The old familiar white of egg in lime cement is a very crude form of using an albuminous cement. A much better cement is obtained by replacing egg albumen with the casein obtained from cheese or skimmed milk. These substances, when mixed with lime, form an albuminate of calcium, which is a very adhesive but quickly hardening cement, especially when dissolved in water-glass (*i.e.*, silicate of soda or potash). Casein forms strong cements for glass or china when dissolved in an aqueous concentrated solution of borax.

To Produce Pure Casein.

Remove all cream from new milk and set the vessel in a warm place until the milk curdles, collect the curd, wash it several times in water until no longer acid, and then dissolve the curd in one of the menstrua mentioned above.

A recently patented process of preparing casein is to add dilute sulphuric acid to skimmed milk at 100° to 120° F., draining and washing the precipitate and re-dissolving it in a solution of carbonate of soda, from which it is re-precipitated by the addition of acetic acid of about 29 per cent. at about 80° to 100° F. The precipitate is again washed in cold water and re-dissolved in the minimum quantity of sodium bicarbonate solution, which gives a pure white soluble solid, but weakly alkaline casein.

A Cement for Pottery-ware, Stone, &c.,

—is prepared by cutting up cheese made from skimmed milk in slices and boiling them in water until reduced to a pulp, then wash this in cold water and knead it several times; put this curdy mass on a slab or stone and rub it up with a muller with quick-lime to form a putty. This will quickly unite together marble and several other substances.

Cement for Earthenware.

Dissolve 1 oz. of isinglass in 4 oz. of water by gentle heat, drain off all unabsorbed water, and then mix the swollen isinglass with 4 oz. of glacial acetic acid.

Flexible Colourless Cement.

Dissolve 3 oz. of Para rubber in 5 fluid oz. of chloroform,

and then add 1 oz. of mastic resin powdered; when the mixture is homogeneous it is ready for use.

Elastic Cement for India-rubber, Gutta-percha, Leather, and Many Other Materials

—is prepared by dissolving 1 oz. of Para rubber in ½-oz. of raw linseed oil by heating it. Separately melt 4 oz. of gutta-percha, and while hot stir in 1 oz. of pitch (asphaltum) and ½-oz. of shellac; when these have been dissolved mix in the india-rubber solution, mould this mass into sheets or cakes, and for use re-melt and use hot.

A Cement for Common Glass-ware

—is prepared by mixing 1 oz. of Venice turpentine and 2 oz. of shellac together, and then adding 5 oz. of pumice-stone. Use hot.

A Cement for Paraffin Lamps.

The following compound is a very useful adhesive for fixing the glass bodies of paraffin lamps to the metal stand:—

Dissolve 1 oz. of caustic soda in 5 oz. of water and boil therein 3 oz. of common rosin; this will produce a resinate, which is mixed with half its weight of plaster of Paris and used at once. The cement is insoluble in petroleum, &c.

A Cement for Microscopic Specimens.

—is prepared by mixing together

2 parts dry white lead.
2 ,, red lead.
3 ,, litharge.

Then rub the mixture into a paste with sufficient gold size to make it of a creamy consistence. This cement does not perfectly set for 14 days, but it stands heat very well, and also is not soluble in alcohol. For mounting opaque objects put 2 parts of isinglass in 1 part of gum arabic into a bottle and cover them with absolute alcohol and stand in a warm place until dissolved.

A Cement for Meerschaum Pipes

—is prepared by boiling fresh cheese in twice its weight of water and mixing 10 parts of this cheese with 2½ parts of lime and 2 parts of wood-ashes.

An Adhesive Cement for Repairing Plaster-of-Paris Casts

—consists in dissolving shellac in alcohol or in using a silicate of soda solution as an adhesive.

A Cement for Ivory and Bone.

1 oz. isinglass.
2 ,, white glue.
1½ ,, water.

Soak and then dissolve the glue and isinglass in the water and heat this mixture until by evaporation it is reduced to only one-fifth of its original bulk; then add 1 oz. of mastic varnish (prepared by dissolving 1 oz. of mastic resin in ½ fluid oz. of alcohol), and add ½ to 1 oz. oxide of zinc. Mix well while hot and then set aside to cool For use it is warmed and shaken up.

A Useful Household Cement for General Use

—is prepared by dissolving 6 oz. of good glue in 8 oz. of acetic acid, and mixing this with a solution composed of 1 oz. of French gelatine in 8 oz. of water; then adding 1 pint of shellac varnish.

Cement for Tortoise-shell Ornaments.

Dissolve 15 parts of shellac and 5 parts of mastic in 65 parts of alcohol and add 1 pint of oil of turpentine.

Cement for Statuary: Plaster of Paris, Stone, Glass, &c.

Mix together—

6 oz. sulphur.
4 ,, white Burgundy pitch.
1 ,, shellac.
2 ,, elemi resin.
2 ,, mastic resin powdered.
6 ,, china clay, very dry.

First melt the pitch, then add the shellac, elemi, and plaster, and when they are incorporated add the sulphur. When this has dissolved in the mass work in the china clay and mould while warm into sheets. For use, re-melt by heat of a flame and apply to the hot surface of the part to be united.

A Liquid Glue for Household Use.

Soak 1 lb. of good glue in 1½ pints of cold water for five hours, then add 3 oz. of sulphate of zinc (white vitriol) and 2 fluid oz. of hydrochloric acid, and keep the mixture heated

for 10 to 12 hours at 175° to 190° F. The glue remains liquid and may be used for sticking a variety of materials.

The following liquid glue is also acid, but useful for many purposes:—Dissolve glue in its own weight of warm water, and then add 5% to 6% of nitric acid and 5% to 6% of sulphate of lead.

A Waterproof Adhesive for Aquariums.

Dissolve Para rubber in naphtha, and then add asphaltum to the mixture equal in weight to twice the weight of the rubber first dissolved, so as to make a compound having the consistency of flour paste.

A Simple Mountant for Photographic Use

—is to boil rice-flour in water until a liquid of the consistency of cream is obtained.

Pastes for the Household.

An adhesive for fastening engravings, prints, drawings, plans, maps, &c., on to stretching canvas or cardboard mounts is prepared as follows:—

Make a mixture of gum dragon and gum arabic mucilage. The gum arabic mucilage is made by digesting the gum in cold water to the consistency of syrup and allowing all débris to settle before pouring off the clear portion for use. The gum dragon (*i.e.*, tragacanth) solution is made by digesting the powdered gum in cold water for a week or so until the gum has dissolved and swelled to a thick mucilage. About 1 drachm of powdered gum dragon in a pint of cold water will make a thick mucilage. It takes a considerable time to

dissolve, but the use of such aids to solution as oxalic or sulphuric acid is not advisable in the present case.

Paste for Wall-papers.

Make up a thin batter with flour and cold water in which alum (about 1 to 2 oz. to a gallon of water) has been added. Then pour on the batter sufficient boiling hot water to cause it to thicken, stirring continuously while adding the water, so as to prevent the mass becoming lumpy. If it is not thick enough it may be boiled: it is best to do this in a glue-pot or steam-jacketed kettle, so as to prevent the paste burning. When sufficiently cooked throw a little cold water over the paste to prevent it skinning; this cold water will not interfere with the adhesive, as it can be stirred into the paste with a brush when using the paste, which is employed rather thin.

CHAPTER VI.

OFFICE GUMS, PASTES, AND MUCILAGES.

Glue and Starch Pastes—Paste for Paper, Parchment, &c.—Paste for Smooth Metallic Surfaces—Transparent Paste for Paper Labels—Gum Arabic Mucilage—Gum Arabic Paste—A Gum Paste or Thick Mucilage Office Mucilage, Flexible—Liquid Glue—Inexpensive Liquid Glue.

Office Gums, Pastes, and Mucilages.

Glue and Starch Pastes.

Ingredients:—

2 oz. wheat starch.
6 ,, glycerine.
½ ,, carbolic acid.
4 ,, loaf sugar.
8 ,, gelatine or white glue.
Water, *q.s.*

Soak the glue in water until it has dissolved its own weight, then melt by heating it in a glue-pot and stir in the sugar. Separately make the starch into a paste with the glycerine, and mix this with the hot glue. Thin the compound with about 3 pints of boiling water.

Adhesive Paste for Paper, Parchment, &c.

Ingredients:—

1 lb. wheat-flour paste.
2 oz. gelatine.
8 ,, water.
3 drachms silicate soda.
Oil of cloves, *q.s.*

Soak the gelatine in the water until soft, then dissolve it in a glue-pot, and while boiling hot stir it into the flour paste, which has been made in the usual way, then boil up the mixture until thickened, allow to cool, and add the silicate of soda and clove oil.

Paste for Smooth Metallic Surfaces.

Ingredients:—

1 lb. wheat flour.
1 pint water.
1 oz. alum.
1 ,, borax.
1½ ,, hydrochloric acid.

Make the flour into a smooth batter with a little cold water; in the remainder of the water dissolve the alum and borax, then make this boiling hot and pour it on to the batter and heat the mass until it becomes transparent. Owing to the acid nature of the paste it corrodes the metallic surfaces, and thereby causes a firm adherence, but is equally applicable for glass or other smooth surfaces.

Transparent Paste for Paper Labels to Adhere to Metals.

Dissolve 1 oz. of gum dragon and 4 oz. of gum arabic in

1 pint of cold water. This will occupy a week or more, and the mucilage should be strained through linen, or else all the whitish pieces of undissolved gum dragon picked out, then stir in 4 oz. of glycerine and 1 drachm of thymol, finally pour on 12 fluid oz. of boiling water.

Gum Arabic Mucilage

—may be improved in its adhesive qualities by the addition of sulphate of alumina (about 5% to 10% of the weight of gum arabic used); or else make an addition of acetate of lead, and thicken with wheat flour, and heat the compound to nearly the boiling temperature.

A Gum Arabic Paste

—is made by mixing a solution of gum acacia mucilage with twice its weight of loaf sugar; then add common starch equal in weight to the gum mucilage, and boil up to a paste.

A Gum, Paste, or Thick Mucilage

—is obtained by the action of nitric acid on potato flour, which converts it into a glutinous mass akin to dextrine. It is very adhesive, but owing to its acid nature cannot be used on metal.

(a) 1 lb. potato or farina flour.
4½ gills water.
1⅞ oz. pure nitric acid.

(b) 1 lb. gum acacia
3 oz. sugar.
3 gills water.
½ oz. nitric acid

In *(a)* make the farina into a paste with water and then mix in the nitric acid and stir the mixture well. Set aside for 48 hours with frequent stirring. The acid will convert the farina into a dextrine mucilage. Then boil this mass until it thickens. *(b)* Separately dissolve the gum in the water, add the sugar, and when that has dissolved stir in the acid and heat the mass until it melts, then mix the two liquids.

Office Mucilage.

Dissolve 1 lb. of gum arabic in 1 quart of water and add 4 oz. of glycerine. This makes a very useful flexible adhesive, whereas ordinary gum arabic mucilage is brittle and cracks, and will not adhere to smooth surfaces without peeling off.

A Liquid Glue

—is a very useful article to have ready for use at a moment's notice. There are many formulæ, most of which produce acid compounds, because the glue is kept fluid by the presence of nitric or acetic acid. Such acid glues consequently are not generally applicable. The following compound, however, is free from this defect:—

Soak 1 lb. of good glue in 1 quart of water for a few hours, then melt the glue by heating it, along with the undissolved water, then stir in ¼-lb. dry white lead, and when that is well mixed pour in 4 fluid oz. of alcohol and continue the boiling for five minutes longer.

A Very Inexpensive Liquid Glue

—is prepared by first soaking and then dissolving gelatine in

twice its own weight of water at a very gentle heat; then add glacial acetic acid in weight equal to the weight of the dry gelatine.

Another cheap (but acid) liquid is prepared by dissolving 5 parts of glue in 13 parts of water, and after adding 1 part of commercial nitric acid continue heating the mixture at about 150° F. for several hours.

CHAPTER VII.

ADHESIVE COMPOUNDS FOR FACTORY AND WORKSHOP USE.

ADHESIVE AGGLUTINANT FOR TEXTILE FABRICS TO FASTEN THEM TO VARIOUS MATERIALS.

Make a paste with rye flour in the usual way, and while boiling hot stir in 25% of its weight of good glue solution made in the usual way. To prevent the paste drying harsh and stiff, a little sugar, treacle, or glycerine may be added to the glue solution before adding it to the flour paste.

Waterproof Adhesive for Coating Paper Surfaces.

5 gills alcohol.
1 oz. elemi resin.
4 ,, mastic resin.
10 ,, sandarac resin.

Digest all together and coat the paper with common glue size before applying this adhesive.

Adhesive or Preservative Gloss for Various Materials.

A colourless gloss for prints, pencil drawings, plans, paper, cardboard, leatherette, and other materials is prepared by dissolving 1 lb. of best white gum arabic in 3 pints of water and then adding 1 lb of glucose. This mucilage dries with a gloss, but is not waterproof; it, however, is useful for coating paper labels or to act as an adhesive for same.

An Adhesive Coating for Preventing Injury to the Films of Photographic Negatives

—is prepared by dissolving 1 oz. of gum benzoin and 2½ oz. sandarac resin in 40 fluid oz. of alcohol. Methylated spirit (if not methylated with mineral oils) may be used instead of alcohol.

Gold Size

—is an adhesive for fixing gold leaf to other metals. 8 parts of copal resin are heated until in a fluid condition, then 2 parts of linseed oil added, and the whole heated until the mixture "strings"; then 6 parts of hot boiled oil are added, and when this is well incorporated sufficient oil of turpentine

is mixed in to give the desired consistence; all parts by weight.

Coating Paper Labels for Tinned Iron.

Make a batter of flour and cold water in which alum has been dissolved (about ¾-oz. of alum per 16 oz. flour), and then make this batter into a paste by boiling it; allow it to become cold and then stir in 20% to 25% of its weight of genuine honey. This paste is not acid and will not corrode the metal.

Adhesive for Paper Labels.

The following is of an acid nature and therefore is not serviceable for use on metal receptacles:—

No. 1.—Rub up in a mortar 1 lb. of dextrine in 1 pint of cold water. [Never use hot water to dissolve dextrine, as that nullifies its adherence.] When all the dextrine is made into a smooth batter, add 4 fluid oz. of acetic acid.

Paper labels coated with this mucilage can be applied to glazed or rough surfaces simply by moistening the coated side just in the same way as a postage stamp is affixed.

No. 2.—The following is an acid paste which causes paper labels to adhere to tin and metal by setting up a partial corrosion of the metal. The mucilage, however, is expensive and must be used hot, therefore it is not adapted for commercial use, only for special cases when a small quantity is required. It is prepared by adding isinglass to acetic acid and dissolving same by a gentle heat, adding as much isinglass as the acid will dissolve. It sets to a jelly when cold and re-melts on heating.

No. 3.—A strong adhesive for paper labels that is adapted for glazed surfaces is prepared by dissolving gum arabic in its own weight of water and then adding 25% of its weight of gelatine (previously soaked in water until it has absorbed its own weight). Add about 2% of glycerine and 3% of camphor, and digest the whole together at a gentle heat.

No. 4.—The following adhesive is non-acid and cheap enough to be used on a commercial scale for labels that are to be attached to tinned goods:—Soak 1½ lb. of white glue in 5 pints of water for 10 hours, then melt by heat in a glue-pot, and while boiling hot stir in 2¾ lb. of sugar foots or brown sugar and 1 lb. of gum arabic.

No. 5.—The following is, however, much less expensive. It must be used hot for applying to the metal tins. It has the advantage of being usable on tins and jars containing hot contents, and thus permits such vessels being labelled without waiting for the contents to cool. Soak good glue in water for five hours, then drain it and melt it in a glue-pot, and while nearly boiling add 25% to 30% of brown sugar or treacle. Boil up the mixture for five minutes, when it is ready for use. The coating made with this compound must not be wetted with water to cause it to adhere. The coated side of the labels simply requires to be laid against the hot surface of the vessel, when the heat of the contents will soften the coating and cause the label to adhere. It is non-acid, and therefore usable on metal.

Adhesives for Leather Goods.

Leather is made by so many different processes that it requires special compounds to cause the adherence of leather

to different materials. For example, leather machinery belting is made by tanning butt leather in oak bark, and also tanning the hide by the chrome tannage process. An agglutinant that will be serviceable for the first kind of leather will not answer for the chrome tannage. The usual compound for cementing oak-tanned leather for machinery is one made by preparing an aqueous solution of gelatine or glue, and precipitating the gelatine as a fibrous mass by the addition of tannic acid, or a similar astringent, such as nut galls. The cement so made must be used at once and before the precipitated gelatine loses its quality. The cemented leather must be kept under pressure until the cement has hardened. This compound, however, is a very indifferent one to use and will not cause adherence between chrome-tanned leathers. The writer has had considerable experience in formulating cements for various kinds of leathers, and the following compounds will be found respectively the best to use for the kinds of leather mentioned.

Cement for Oak-tanned Machinery Belting Leathers.

Soak good white glue (not gelatine) in four times its weight of water until the water is almost absorbed, then melt the glue in a glue-pot, together with any unabsorbed water, and bring it to a boil for 10 minutes; then pour out the hot glue into moulds or trays about 3in. deep and allow it to set to a jelly. When cold cut up these cakes of jelly and stand them on a shelf so that they can be fully exposed to a current of dry air for two or three days; then re-melt the semi-solid jelly in a glue-pot, and while boiling hot put in an ammoniacal solution of shellac, in the proportion of $\frac{1}{2}$ to $\frac{3}{4}$ fluid oz. per lb. of glue dissolved. Afterwards, while still boiling, add raw Demarara sugar in proportion of 10% to

20% of the boiling glue; stir well, and allow it to boil for 10 minutes, then set aside to cool. For use, this compound is re-melted by heating in a glue-pot, but no water should be added to the glue, as it melts by heat alone. The more frequently it is re-melted the greater the density and adherence the compound exhibits. It is best to warm the surfaces to which the compound is to be applied before splicing them together, and also to keep the cemented joint under pressure until it dries. If it be dried under cold pressure the glue (owing to the presence of sugar) is liable to become hydroscopic, whereas hot pressure torrifies the glue and renders it like india-rubber and practically insoluble in water and other fluids. This compound can be used for cementing chrome-tanned belting leathers; but in such case the sugar, before being added to the glue, should be melted by heat until the water of crystallization has been expelled and the sugar becomes partly carbonised; then the sugar should be stirred in the hot glue. The addition of the ammoniacal solution of shellac is to increase the drying quality of the glue and cause it to contract with greater power. This solution of shellac is made by raising 1 pint of water to the boil, adding ½ fluid oz. of strong liquid ammonia, and then stirring in 1 oz. of orange shellac, and boiling until the shellac has dissolved. There are peculiar qualities about this compound that are noticeable. If the glue be allowed to become cold and is then cut out from the cooling vessels and exposed freely to dry air, it will dry to a tough elastic mass, in appearance just like india-rubber. Such compound is insoluble in all fluids except water. But if it be torrified by dry heat, water will then not dissolve it. The elastic mass readily dissolves in a glue-pot (that is, by the heat of a water-bath), but the dry heat vulcanises it, so to speak, and renders it insoluble. Any joint made with this glue is flexible and very adherent. Some samples of chrome-tanned belting leather sent to the

writer from Germany several years ago he cemented with this compound, and has kept in a damp cellar for the last two years, but the joint now is as firm as when first made.

Before using this cement, all grease should be removed from the surfaces of the leather on which the cement is to be applied. This is best accomplished by sponging such surfaces with benzine until the grease is extracted. Alkaline solvents should not be used, because the adherence of glue compounds is lessened by the presence of alkalies. To give a strongly made joint, the surfaces should be warmed by passing a hot iron over them before applying the cement, then spreading the cement on one piece of leather only, lay the other piece of leather over this and apply pressure (hot by preference). In about 10 minutes the cement will be dry and the jointed leather will be firmly adherent.

An Adhesive for Raw-hide Belting Leathers

—such as picker bands and combing leathers of looms are made of, is prepared as follows:—Soak equal weights of glue and gelatine for five hours, dissolve them by heating in a glue-pot, and for every pound of glue add 1 oz. of glycerine in which ½-oz. of red lead has been rubbed up, stir the mixture and bring it to a boil, when it is fit to use, or it may be set aside to cool for use as required. The glue is re-melted by the heat of a water-bath, but water should not be added to it, as that would lessen its adhesive qualities.

The glue is flexible, but eventually dries very hard, and adheres most tenaciously to leather and other materials. It becomes practically waterproof. Corrosive sublimate may be mixed with the glycerine instead of red lead, but the sublimate produces a very poisonous compound, which possesses no advantage over the red lead.

An Adhesive for Fastening Split Leathers, Skivers, Moroccos, Roans, &c., for the Tops of Tables, Leather Dressing-cases, and Bags

—is prepared by first rubbing up 3 oz. of starch powder and 8 oz. of alcohol; secondly, dissolve 1½ oz. of gelatine in 1½ oz. of water (first soaking it in water for one hour before dissolving by heat), add 1½ fluid oz. of turpentine, and while this glue compound is boiling hot stir in the starch paste and raise to the boil for a few minutes. This compound, when properly prepared, will not penetrate through the fibre of the leather to spoil the dyed surface.

An Adhesive for Fastening Book Muslin to Paper for the Production of Untearable Envelopes, Mounts for Maps, &c.,

—is prepared by making ordinary flour paste in the usual way and adding 5 % to 10 % of its weight of liquefied Venice turpentine. Continue boiling the mass till the two have combined. This paste is spread on the paper, the muslin laid over it, the sheets then passed between rollers to press out all the superfluous paste, and finally dried by passing through heated rollers, when the paper cannot be detached from the muslin without tearing the paper. This is also a useful adhesive for straw-boards and flint papers.

A Waterproof Adhesive for Rubber Tyres

—is prepared by dissolving Para rubber in benzine to the consistency of treacle and then mixing the softened rubber with twice its own weight of orange shellac and standing the bottle in which the material is made in a vessel of hot water until the shellac has dissolved in the rubber. This compound is elastic and should be used warm, because on cooling it sets to a firmly adherent mass.

A Waterproof Glue,

—suitable for a variety of materials, is prepared by mixing 1 part of linseed oil with 2 parts of glue solution made in the usual way, and then adding 1 % of powdered litharge. Instead of the latter ingredient 5 % of a sandarac varnish may be added to the glue solution. This varnish is made by dissolving—

1 oz. mastic resin,
1 ,, sandarac resin,
in 16 ,, fluid oz. alcohol, and when dissolved adding
1 fluid oz. of turpentine.

Another adhesive compound for the same purpose is to soak glue in water for one hour, then melt it in strong vinegar and add sufficient flour to the mixture to make it into a stiff paste, but as this compound is of an acid nature it will discharge the colour of blue paper.

An Adhesive for Photographic Prints

—is prepared by soaking 1 part of gelatine in 100 parts of water, and then adding 10 parts of arrowroot starch paste (made by mixing arrowroot into a batter with a little cold water), then gently heat the mixture until it boils, and finally stir in 10 parts of strong alcohol, and work the whole into a smooth mass free from lumps.

An Adhesive for Affixing Tinfoil on Leyden Jars. Electroscopes, &c.,

—is prepared by dissolving flour in a solution of sodic hydrate of medium strength and diluting with water, then add a small percentage of Venice turpentine and mix by heating.

Paste for Paper-bag Makers.

Ingredients :—

Wheat flour.
Boiling water.
Venice turpentine.

Make a batter of the flour with 7 to 10 parts of cold water to 1 part of flour, and pour on this batter enough boiling hot water to thicken it, and while hot put in 6% to 10% of hot liquefied Venice turpentine and stir well until this has become incorporated with the paste; but the mixture must not be boiled, as that would destroy its adhesive qualities. This paste can be used hot or cold.

Cements for Celluloid.

A solution of celluloid and amyl acetate will unite celluloid to any material, or any of the following cements may be used :—

No. 1. Digest 1 oz. celluloid in a mixture composed of
3 oz. acetate amyl.
3 ,, acetone.
3 ,, methylated sulphuric ether.
4 ,, camphor.

No. 2. 2 oz. shellac.
2 ,, spirits of camphor.
7 ,, absolute alcohol.

Dissolve the shellac in the camphor spirit and then mix in the alcohol.

Adhesive to Prevent Leakage of Gas from Gas Bags Used with the Lime-light.

Mix glycerine with a solution of good glue and spread this over the surface of the bag and allow to dry.

Cement for Sealing Potted Meat, Fruit, &c.

Melt together 1 lb. of rosin and 1 oz. of tallow.

Adhesive for Fixing Labels to Nickel.

Dissolve 2½ lb. of dextrine in 1¼ quarts of water, then add 2 oz. of glycerine and 1 oz. of glucose, and heat the whole, stirring well.

An Adhesive for Preventing the Escape of Liquids from Glass Bottles

—is made by mixing almond meal or linseed meal (from which the oil has been extracted) with an equal quantity of whiting made into a paste with water. This is made and used like a putty round the stopper or cork.

Gas-fitters' or Plumbers' Cement.

9 oz. common rosin.
2 ,, beeswax.
6 ,, red oxide iron.

Melt the wax and resin together and then mix in the red oxide to make a putty.

A Waterproof Cement for the Glass of Green-houses

—is made by soaking good glue in water for two hours, then dissolve it in a glue-pot, and for every 4 parts of glue solution add 1 part of Venice turpentine.

Cement for Electrical Purposes (Liquid).

Dissolve india-rubber in oil of turpentine by heat and then add 5 % of raw linseed oil. For a solid insulating cement mix

8 oz. yellow pitch.
2 ,, beeswax.
1 ,, tallow.

Cement for India-rubber.

No. 1. Digest together in sufficient carbon bisulphide
oz. rubber (not vulcanised).
,, rosin.
1 ,, shellac.

Keep in air-tight bottles.

No. 2.—Dissolve ¼-oz. of pure rubber in 16 fluid oz. of chloroform and then add 4 oz. of finely powdered mastic resin, and allow the whole to digest for a week.

Cement for Engineers' Use.

Melt together to a syrup—

50 oz. sulphur.
1 ,, tallow.
1 ,, rosin.

To the melted mass add sufficient finely powdered glass or graphite to make a paste. Use while hot.

Gutta-percha Cements

—are made in a solid form by melting together equal weights

of gutta-percha and pitch. If desired thinner add 2 parts of linseed oil in which 5 parts of litharge has been heated.

A liquid gutta-percha cement is made by dissolving gutta-percha in any of the solvents used for rubber.

Cutlery Cement.

No. 1.—Melt 4 oz. of black rosin and 1 oz. of beeswax together, then stir in 1 oz. of plaster of Paris or brick dust; allow the wax to cool, then reduce it to powder. Fill the hole in the handle, heat the tang of the knife or fork, and press it well into the cement, and hold it there until it is cold. Wipe off all the superfluous cement that melts and flows out of the orifice.

No. 2. 1 oz. pitch.
1 ,, rosin.
2 ,, mutton tallow.

Melt it together.

Adhesive for Attaching Metal Letters to Glass.

No. 1.—Dissolve common rosin in a lye of caustic soda, precipitate the rosin with a weak or diluted acid, and knead the resinate into a plastic mass of plaster of Paris and use at once. For a slower setting cement use zinc white or slaked lime instead of plaster of Paris.

No. 2.—Mix together—

16 oz. copal varnish.
5 ,, drying oil.
3 ,, Venice turpentine.
3 ,, oil of turpentine.
5 ,, liquid glue.
10 ,, stucco or Portland cement.

Mix the ingredients in the order named and add the stucco last.

During the last few years several new adhesives have been put on the market, such as "Gloy," which is an adhesive for the office use. Seccotine is a household adhesive, put up in collapsible tubes, and is useful for many purposes, for which a water-glass or similar cement is useful.

HEDORAL

—is a cement recommended for leather goods, paper, and cardboard. It is apparently a compound of glue and flour formed into a paste, with cloves as an antiseptic, and is a very clean, strongly adherent paste.

Several other adhesives the writer has had submitted to him from time to time, but as they have sunk out of recognition it is a fair inference that they have not fulfilled the claims of their inventors or have not met the wants for which they were intended.

INDEX.